



# **SURFACE VEHICLE RECOMMENDED PRACTICE**



**J1939-71 FEB2010**

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Superseding J1939-71 JAN2009

Vehicle Application Layer (Through February 2009)

## **RATIONALE**

New parameters and parameter groups are reviewed and discussed by the Truck and Bus Control and Communications Network Committee on a regular basis. This SAE Recommended Practice has been updated to reflect all changes and additions approved and balloted through February 2009.

## **FOREWORD**

This series of SAE Recommended Practices has been developed by the Truck and Bus Control and Communications Network Committee of the Truck and Bus Electrical and Electronics Steering Committee. The objectives of the committee are to develop information reports, recommended practices, and standards concerned with the requirements design and usage of devices that transmit electronic signals and control information among vehicle components. The usage of these documents is not limited to truck and bus applications; other applications may be accommodated with immediate support being provided for construction and agricultural equipment, and stationary power systems. These documents are intended as a guide toward standard practice and are subject to change so as to keep pace with experience and technical advances.

New parameters and parameter groups are reviewed and discussed by the Truck and Bus Control and Communications Network Committee on a regular basis. This documents reflects all changes and additions approved and balloted through February 2009.

## **1. SCOPE**

As described in the parent document, SAE J1939, there is a minimum of seven documents required to fully define a complete version of this network. This particular SAE Recommended Practice, SAE J1939-71, describes an Application Layer for vehicle use.

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## 2. REFERENCES

### 2.1 Applicable Publications

General information regarding this series of recommended practices is found in SAE J1939. Unless otherwise specified, the latest issue of SAE publications shall apply.

#### 2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), [www.sae.org](http://www.sae.org).

SAE J1349	Engine Power Test Code—Spark Ignition and Compression Ignition—Net Power Rating
SAE J1843	Accelerator Pedal Position Sensor for Use with Electronic Controls in Medium- and Heavy-Duty Vehicle Applications
SAE J1922	Powertrain Control Interface for Electronic Controls Used in Medium- and Heavy-Duty Diesel On-Highway Vehicle Applications
SAE J1939	Recommended Practice for a Serial Control and Communications Vehicle Network
SAE J1939-21	Data Link Layer

#### 2.1.2 ISO Publications

Available from ANSI, 25 West 43rd Street, New York, NY 10036-8002, Tel: 212-642-4900, [www.ansi.org](http://www.ansi.org).

#### 2.1.3 Other Publications

Patent EP000001386774B1, "Control Apparatus for Brakes of a Commercial Vehicle", Held by Knorr-Bremse Systeme, Germany, Date 8/1/2003, included with permission from the patent holder

## 3. DEFINITIONS

See SAE J1939 for terms and definitions that are not defined in this document.

## 4. ABBREVIATIONS

ACC	Adaptive Cruise Control or Autonomous Cruise Control
ATA	American Trucking Association
CTI	Central Tire Inflation
EBS	Electronic Braking System
FMS	Fleet Management System
Kp	Engine endspeed governor gain
ROP	Roll Over Prevention
VDC	Vehicle Dynamic (Stability) Control
VGT	Variable Geometry Turbocharger
VMRS	Vehicle Maintenance Reporting System

See SAE J1939 for additional abbreviations that may be used in this document.

## 5. TECHNICAL REQUIREMENTS

The Application Layer provides a means for application processes to access the OSI environment. This layer contains management functions and generally useful mechanisms to support applications.

### 5.1 General Guidelines

#### 5.1.1 Signal Characterization

It is the intent of the SAE J1939 network to provide current data and signals from a source so that it may be used by other nodes. It is recommended that the time between physical data acquisition of a signal and the transmission of the data should not exceed two times the repetition rate defined for the data. Additional constraints may be defined for certain parameters (see also 5.1.7.2).

#### 5.1.2 Message Format

The message format of SAE J1939 uses the parameter group number as the label for a group of parameters. Each of the parameters within the group can be expressed in ASCII, as scaled data defined by the ranges described in 5.1.4, or as function states consisting of two or more bits. Alphanumeric data will be transmitted with the most significant byte first. Unless otherwise specified, alphanumeric characters will conform to the ISO Latin 1 ASCII character set as shown in section 5.1.3. Other parameters consisting of 2 or more data bytes shall be transmitted least significant byte first.

The type of data shall also be identified for each parameter. Data may be either status or measured. Status specifies the present state of a multi-state parameter or function as a result of action taken by the transmitting node. This action is the result of a calculation which uses local and/or network "measured" and/or "status" information. Note that specific confirmation of this action is not necessarily assured. For instance, the status may indicate that a solenoid has been activated, yet no measurement may have been taken to ensure the solenoid accomplished its function. Examples of status-type data are: engine brakes are enabled, PTO speed control is active, cruise control is active, the cruise control is in the "set" state of operation (as opposed to a measured indication that the "set" switch contacts are closed), fault codes, torque/speed control override modes, desired speed/speed limit, engine torque mode, engine's desired operating speed, engine's operating speed asymmetry adjustment, etc.

Measured data conveys the current value of a parameter as measured or observed by the transmitting node to determine the condition of the defined parameter. Examples of measured-type data are: boost pressure, ignition on/off, cruise set switch activated, maximum cruise speed, cruise set speed, engine speed, percent load at current speed, etc.

A device shall not receive SPN data from the network segment and retransmit that same SPN data using the same SPN back onto the same network segment.

#### 5.1.3 ISO Latin 1 Character Set

- (R) There are 191 graphic characters of the ISO 8859-1 Latin 1 Character set show below. Unless otherwise specified, only these 191 character values are permitted for ASCII parameters. The terminology 'ASCII characters' and 'printable ASCII characters' are used in J1939 to refer to this set of 191 graphic character values.
- (R) The remaining 65 characters values (0 through 31 and 127 through 159) are control functions. According to ISO 8859-1, these character values are defined in ISO 6429. The terminology 'ASCII control characters' and 'non-printable ASCII characters' are used in J1939 to refer to this set of 65 character values. As specified in ISO 6429, the character value 0 (zero) is the 'NULL' character.

Horizontal boldface characters are the single hexadecimal digit representing the lower nibble of the single byte code for the character. Vertical boldface characters are the single hexadecimal digit representing the upper nibble of the single byte code for the character.

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	----- should not be displayed -----															
1	----- should not be displayed -----															
2	space	!	"	#	\$	%	&	'	(	)	*	+	,	-	.	/
3	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
4	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
5	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
6	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
7	p	q	r	s	t	u	v	w	x	y	z	{		}	~	nil
8	----- should not be displayed -----															
9	----- should not be displayed -----															
A	nil	ı	¢	£	¤	¥		§	¨	©	ª	«	¬	-	®	—
B	°	±	²	³	´	µ	¶	·	¸	¹	º	»	¼	½	¾	¿
C	À	Á	Â	Ã	Ä	Å	Æ	Ç	È	É	Ê	Ë	Ì	Í	Î	Ï
D	Ð	Ñ	Ò	Ó	Ô	Õ	Ö	×	Ø	Ù	Ú	Û	Ü	Ý	Þ	ß
E	à	á	â	ã	ä	å	æ	ç	è	é	ê	ë	ì	í	î	ï
F	ð	ñ	ò	ó	ô	õ	ö	÷	ø	ù	ú	û	ü	ý	þ	ÿ

#### 5.1.4 Parameter Ranges

Table 1 defines the ranges used to determine the validity of a transmitted signal. Table 2 defines the ranges used to denote the state of a discrete parameter and Table 3 defines the ranges used to denote the state of a control mode command. The values in the range “error indicator” provide a means for a module to immediately indicate that valid parametric data is not currently available due to some type of error in the sensor, sub-system, or module.

The values in the range “not available” provide a means for a module to transmit a message which contains a parameter that is not available or not supported in that module. The values in the range “not requested” provide a means for a device to transmit a command message and identify those parameters where no response is expected from the receiving device.

If a component failure prevents the transmission of valid data for a parameter, the error indicator as described in Tables 1 and 2 should be used in place of that parameter’s data. However, if the measured or calculated data has yielded a value that is valid yet exceeds the defined parameter range, the error indicator should not be used. The data should be transmitted using the appropriate minimum or maximum parameter value.

### 5.1.5 Assignment of Ranges to New Parameters

This section is intended to define a set of recommended SLOTS (Scaling, Limit, Offset, and Transfer Function) which can be used when parameters are added to J1939. This permits data consistency to be maintained as much as possible between parameters of a given type (temperature, pressure, speed, etc.). Each SLOT is intended to provide a range and resolution suitable for most parameters within a given type. When necessary, a different scaling factor or offset can be used. All SLOTS should be based on a power of 2 scaling from another SLOT. This will minimize the math required for any internal scaling and reduce the opportunity for misinterpreted values. Offsets should be selected preferably on the following basis:

- Offset = 0, or
- Offset = 50% (equal  $\pm$  range)

Appendix A defines the recommended SLOTS to be used when ranges are assigned to new parameters.

Unless otherwise specified, all pressure SLOTS are measured as gage pressure.

**TABLE 1 - TRANSMITTED SIGNAL RANGES**

Range Name	1 byte	2 bytes	4 bytes	ASCII
Valid Signal	0 to 250 00 <sub>16</sub> to FA <sub>16</sub>	0 to 64 255 0000 <sub>16</sub> to FAFF <sub>16</sub>	0 to 4 211 081 215 00000000 <sub>16</sub> to FAFFFFFF <sub>16</sub>	1 to 254 01 <sub>16</sub> to FE <sub>16</sub>
Parameter specific indicator	251 FB <sub>16</sub>	64 256 to 64 511 FB00 <sub>16</sub> to FBFF <sub>16</sub>	4 211 081 216 to 4 227 858 431 FBxxxxxx <sub>16</sub>	none
Reserved range for future indicator bits	252 to 253 FC <sub>16</sub> to FD <sub>16</sub>	64 512 to 65 023 FC00 <sub>16</sub> to FDFF <sub>16</sub>	4 227 858 432 to 4 261 412 863 FC000000 <sub>16</sub> to FDFFFFFF <sub>16</sub>	none
Error indicator	254 FE <sub>16</sub>	65 024 to 65 279 FExx <sub>16</sub>	4 261 412 864 to 4 278 190 079 FExxxxxx <sub>16</sub>	0 00 <sub>16</sub>
Not available or not requested	255 FF <sub>16</sub>	65 280 to 65 535 FFxx <sub>16</sub>	4 278 190 080 to 4 294 967 294 FFxxxxxx <sub>16</sub>	255 FF <sub>16</sub>

**TABLE 2 - TRANSMITTED VALUES FOR DISCRETE PARAMETERS (MEASURED)**

Range Name	Transmitted Value
Disabled (off, passive, etc.)	00
Enabled (on, active, etc.)	01
Error indicator	10
Not available or not installed	11

**TABLE 3 - TRANSMITTED VALUES FOR CONTROL COMMANDS (STATUS)**

Range Name	Transmitted Value
Command to disable function (turn off, etc.)	00
Command to enable function (turn on, etc.)	01
Reserved	10
Don't care/take no action (leave function as is)	11

### 5.1.6 Adding Parameters to Groups

Several of the Parameter Groups contain bytes that are not defined and may be replaced with new parameters as appropriate. If existing parameter group definitions do not permit the inclusion of a new parameter, a new parameter group may be defined. Refer to SAE J1939 for additional definitions and abbreviations for instructions for adding new parameters to parameter groups and for requesting new parameter group numbers.

In general, parameters should be grouped into parameter groups as follows:

- a. By function (Oil, Coolant, Fuel, etc.) and not by type (temperature, pressure, speed, etc.)
- b. With similar update rates (to minimize unnecessary overhead)
- c. By common subsystem (the device likely to measure and send data)

### 5.1.7 Transmission Repetition Rates (Update Rates)

#### 5.1.7.1 Definition of Transmission Repetition Rate

All transmission repetition rates defined in SAE J1939/71 are nominal rates. The actual transmission repetition rate on the network should be at this rate plus/minus the "typical" jitter which occurs in microcontroller based systems. The average rate should be the nominal value.

#### 5.1.7.2 Transmission Repetition Rate for Engine Speed and Directly Associated Data (Crank Angle or Time Based Update Rates)

Some parameters may be calculated and/or updated based on engine crank angle rather than at a specific time interval. When this is the case the reference to a specific update rate is not accurate because this time will change based on the speed of the engine. The primary goal is to minimize the latency associated with sampling, calculating and transmitting the data without overburdening the network. There are many approaches to sampling the data to be converted and sent over the network. The two preferred approaches are: (a) Time-based sampling, calculating and transmission; and (b) A hybrid time-based and engine crank angle-based sampling, calculating and transmission where the number of crank angle degrees between updates is modified based on the current operating speed in order to maintain an update rate within an acceptable range (see Figure 1). Because there are multiple ways to acquire and transmit data onto the network the following guidelines have been defined for the engine speed and directly associated data.

1. At speeds above 500 rpm, the time from sampling to message transmission shall not exceed 12 ms. Systems that acquire engine speed information via period measurement inherently have less time delay at higher speeds. Above 1000 rpm, for instance, the time from sampling to message transmission shall range from 5 to 30 ms. Less time is required because the period measurement takes less time at higher speeds. How much time is saved depends on the number of crank angle degrees used to perform the period measurement.
2. "Normal" update rates:
  - a. Time based updates will occur every 20 ms.
  - b. Hybrid time based and engine crank angle based updates are shown in Figure 1

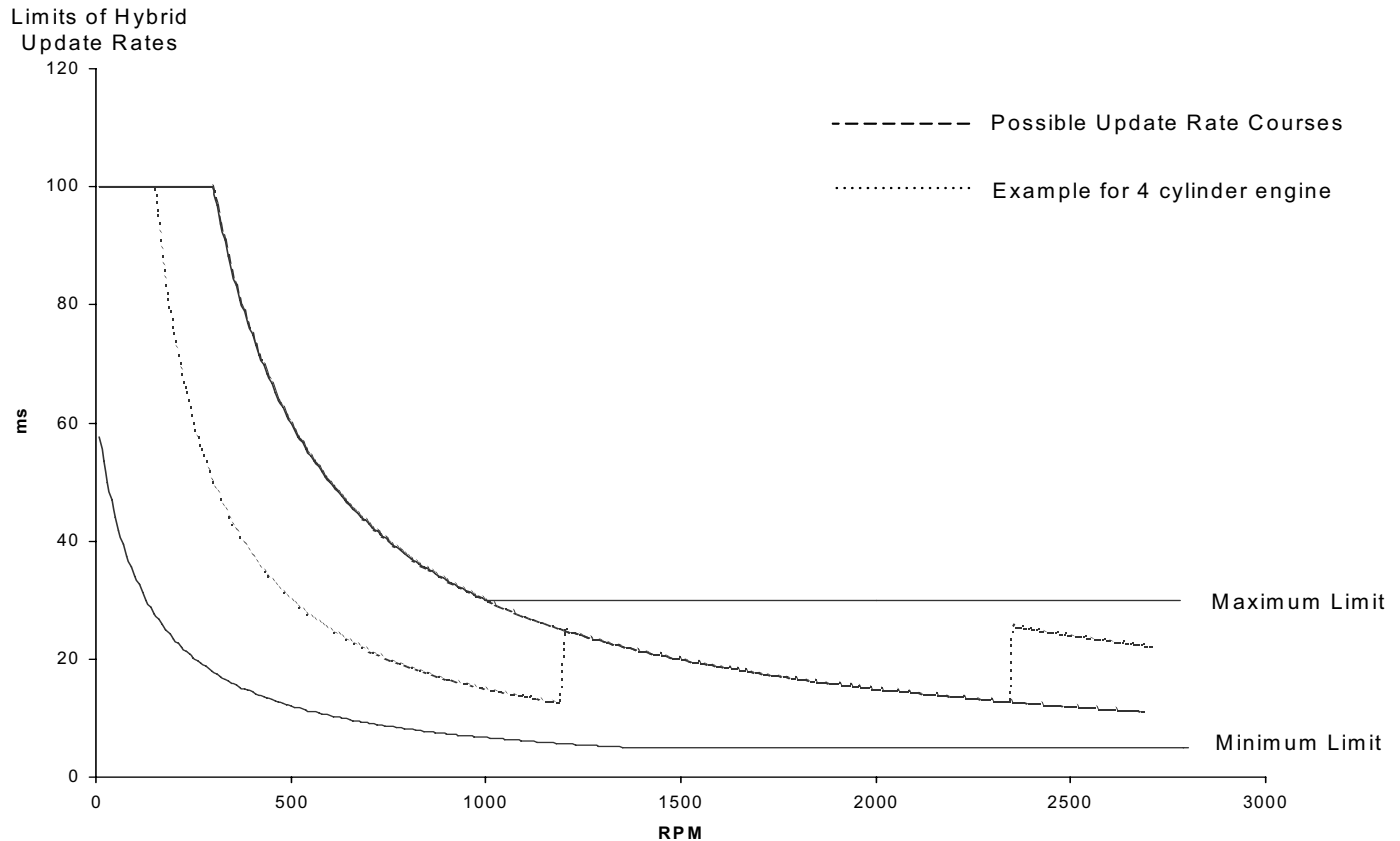


FIGURE 1 - LIMITS OF HYBRID UPDATE RATES

#### 5.1.7.3 Transmission Repetition Rate for On-change Messages

Some periodic messages contain information that is of particular interest when a state change occurs. For example, it is desirable to immediately broadcast a change in the engine configuration rather than waiting a significant period of time for the next periodic update window.

Messages contain information that may change states at a very high rate. A rapidly changing state is not useful to consumers of this information and unnecessarily increases bus loading. An example of this would be a switch state in a cab message.

Transmission repetition rate definition for these messages takes the form of:

Every MAXUPDATEPERIOD and on CHANGECRITERIA but no faster than every MINUPDATEPERIOD

Where:

- CHANGECRITERIA is the criterion that prompts an immediate broadcast of a new message.
- MAXUPDATEPERIOD is the maximum period of the message. When CHANGECRITERIA is not satisfied, this is the preferred period of the message.
- MINUPDATEPERIOD is the minimum period of the message during situations where the update rate of this message must be controlled to a lower frequency than CHANGECRITERIA would otherwise dictate. This does not apply to the first message after a periodic broadcast.

Two acceptable implementations are illustrated below. In each illustration, the horizontal line represents time, the vertical bars topped with a numbered circle represent messages, and the diagonal line represents a timer that counts down to zero, which triggers the transmission of the next periodic message. In both illustrations, all messages are triggered by MAXUPDATEPERIOD except for message 2, which is triggered by CHANGECRITERIA.

Figure 2 shows the method where CHANGECRITERIA results in extra messages that do not change the timing of the subsequent periodic messages. In this illustration, message 2 is triggered by CHANGECRITERIA, but since the countdown timer is not reset, message 3 is then broadcast after MAXUPDATEPERIOD elapses since message 1.

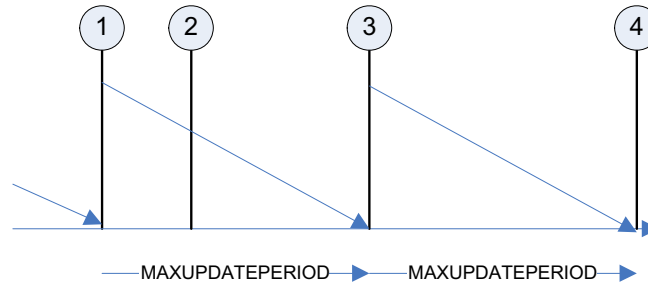


FIGURE 2 – ON-CHANGE IMPLEMENTATION OPTION 1

Figure 3 shows the method where the message period is controlled by the last broadcast message. In this method, message 2 resets the timer, forcing message 3 to occur at a later time than if CHANGECRITERIA had not been satisfied. This implementation results in a lower average bus loading, as illustrated by the lack of message 4 in the same overall time as shown in the previous illustration.

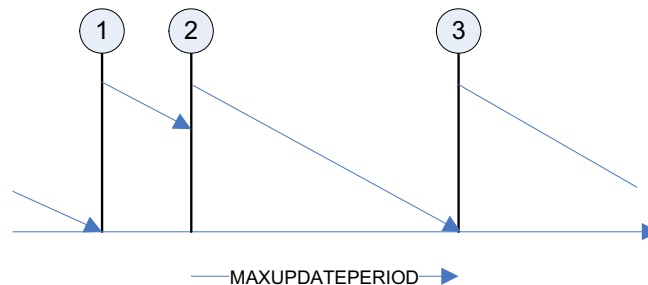


FIGURE 3 – ON-CHANGE IMPLEMENTATION OPTION 2

This message definition was created after many “on change” messages were published. As a result, the implementation of those messages may vary from the description in this section. This section is intended to provide uniformity of future implementations of “on change” messages.

After July 2010, new implementations of “on change” messages are expected to conform to this recommended practice. Many existing implementations prior to that date comply with this definition and no change is required.

While this section describes the preferred implementation, existing implementations prior to July 2010 are grandfathered, and may have an alternate acceptable definition.

### 5.1.8 Naming Convention for Engine Parameters

When there are multiple instances of the same parameter on the same component (i.e., exhaust ports), the following naming convention will be used. While facing the engine from the flywheel housing, left bank (LB) parameters are assigned prior to the right bank (RB) parameters. Front parameters are assigned prior to the rear or back parameters (with the rear/back being the end containing the flywheel housing). For a six cylinder in-line engine, the position furthest



from the flywheel will be identified as 1. For a 12 cylinder "V" engine, the position furthest from the flywheel on the left bank will be identified as 1, followed by the position next closest to the flywheel on the left bank. When only one parameter is required or available, the parameter denoted as number 1 should be used. (i.e., an engine having only one turbocharger would use Turbocharger 1 Compressor Inlet Temperature when broadcasting the temperature).

## 5.2 Parameter Definitions

This section provides a description of each parameter used for in the SAE J1939 network. The description includes data length, data type, resolution, range, and a tag (label) for reference.

After power on, a node should internally set the "availability bits" of received parameters as not available and operate with default values until valid data is received. When transmitting, undefined bytes should be sent as 255 (FF<sub>16</sub>) and undefined bits should be sent as 1.

### 5.2.1 Control Parameters

#### 5.2.1.1 Net Brake Torque (Power)

The measured torque (or power output) of a "fully equipped" engine. A fully equipped engine is an engine equipped with accessories necessary to perform its intended service. This includes, but is not restricted to, the basic engine, including fuel, oil, and cooling pumps, plus intake air system, exhaust system, cooling system, alternator, starter, emissions, and noise control. Accessories which are not necessary for the operation of the engine, but may be engine mounted, are not considered part of a fully equipped engine. These items include, but are not restricted to, power steering pump systems, vacuum pumps, and compressor systems for air conditioning, brakes, and suspensions. When these accessories are integral with the engine, the torque/power absorbed in an unloaded condition may be determined and added to the net brake torque. (Refer to SAE J1349.)

Net brake torque is calculated by subtracting friction torque from indicated torque for the purposes of this document.

#### 5.2.1.2 Friction Torque

The torque required to drive the engine alone as "fully equipped."

- (R) Friction torque is equal to the sum of Nominal Friction - Percent Torque (SPN 514) and Estimated Engine Parasitic Losses - Percent Torque (SPN 2978). Nominal Friction - Percent Torque (SPN 514) includes Estimated Pumping - Percent Torque (SPN 5398).

#### 5.2.1.3 Indicated Torque

Indicated torque is the torque developed in the cylinders. It is defined as the sum of the net brake torque and friction torque.

### (R) 5.2.2 ASCII Parameters

This section describes the standard practices for ASCII data parameters. SAE J1939 has three (3) standard ASCII SLOT Types for different data length designation techniques, which are summarized in Table 4. Some of the ASCII SLOT Types use a delimiter technique for data length designation which may reduce the ASCII characters available for parameter data. The ASCII SLOT Types are discussed individually in more detail in the sections 5.2.1.4, 5.2.1.7, and 5.2.1.8.

The SLOT Table in Appendix A may have multiple ASCII SLOTS for the same ASCII SLOT Type to accommodate different maximum bytes allowed. The numerical designator in the ASCII SLOT Name reflects the maximum bytes allowed for an ASCII SLOT. For example, the ASCII SLOT 'SAEatad0200' has a maximum length of 200 bytes while the ASCII SLOT 'SAEatad0025' has a maximum length of 25 bytes.

TABLE 4 - Summary of ASCII SLOT Types

ASCII SLOT Type	Description	Data Length Indication	Delimiter Character included in Data Length?	Any Characters not allowed within the Data?	Required to fill Data to a specific length?
Fixed Length ASCII	The Data length is a fixed or constant number of bytes	Fixed number of bytes of data	No. The length indicates required data space for parameter data.	No. All of the ASCII characters may be used in the Data	Yes, must provide data in all of the required number of bytes
Character Delimited, Variable Length ASCII	The Data length may vary within defined limits and a specific ASCII character is placed following the Data to indicate the end of the parameter data	Length indicated by the delimiter character (always required).	No. The length indicates allowed data space for parameter data.	Yes. The delimiter character is not allowed within the parameter data, since it will be interpreted as the delimiter	No, unless the ASCII data SPN definition has a minimum data length of 1 or more characters
Byte Count Delimited, Variable Length ASCII	The Data length may vary within defined limits and a separate data parameter (SPN) within the PGN data field specifies the byte length of the ASCII Data	Separate SPN that specifies the ASCII data byte length	No. The length indicates allowed data space for parameter data.	No. All of the ASCII characters may be used in the Data	No, unless the ASCII data SPN definition has a minimum data length of 1 or more characters

#### 5.2.1.4 ASCII Characters

The character values for ASCII Characters are specified in Section 5.1.3 of J1939-71. By default, only the printable ASCII characters are allowed in the data for ASCII parameters. The ASCII control characters, or non-printable ASCII characters, are not allowed in the data for an ASCII parameter, unless the ASCII parameter definition explicitly states otherwise. SPN 162 and SPN 163 are examples of ASCII parameters with explicit statements allowing the use of ASCII control characters in the parameter data.

#### 5.2.1.5 ASCII Byte Order

The standard practice for the ordering of data bytes for ASCII data parameters is defined in Section 5.1.2 of J1939-71.

#### 5.2.1.6 ASCII SLOT Type - Fixed Length ASCII

The Fixed Length ASCII SLOT Type defines an ASCII data parameter with a fixed, or non-varying, number of ASCII characters in the data field. All ASCII characters are available for use in the SPN data with this type of ASCII SLOT.

Some examples of SPNs using a fixed length ASCII SLOT Type are SPNs 162, 3620, and 4254.

#### 5.2.1.6.1 SPN Data Definition for Fixed Length ASCII

An SPN using a fixed length ASCII SLOT Type has the following data definition characteristics:

- The 'Resolution' property indicates "ASCII"
- The 'Data Length' property is a fixed byte length, such as "5 bytes"

All ASCII characters are available for use in the ASCII data with this type of ASCII SLOT.

The 'Data Length' property defines the required byte length of the data for this SPN. If it is possible to have actual SPN data that is shorter than the required data length, then the SPN data definition should specify the acceptable ASCII character(s) for an application to use to fill or pad the remaining data bytes. The definition should indicate if there is a standard for preference for inserting the pad or fill characters before or after the actual SPN data.

#### 5.2.1.6.2 PGN Data Field Details for Fixed Length ASCII Parameters

Within the PGN data field, the specified number of bytes of data is required in the data field position for the fixed length ASCII data SPN, whether the source application supports the SPN or not.

The data for a subsequent parameter shall immediately follow the required number of data bytes.

If the source application is reporting data for the SPN, then the source application must fill each of the data bytes for the SPN. If the actual SPN data is shorter than the required data length, then the source application is required to fill any remaining data bytes. The remaining data bytes shall be filled according to the SPN definition. If the SPN definition does not specify the data fill method, then the application shall fill the remaining bytes as appropriate for the data content.

If the source application does not support the SPN, then the source application is still required to fill each of the SPN data bytes with the "not available" value.

#### 5.2.1.7 ASCII SLOT Type - Character Delimited, Variable Length ASCII

The Character Delimited, Variable Length ASCII SLOT Type defines an ASCII data parameter with a varying number of ASCII characters in the data field, and uses a specific ASCII character (delimiter) to indicate the end of the ASCII text for the parameter. All ASCII characters except for the delimiter character are permitted in the SPN data with this type of ASCII SLOT. The delimiter character is not permitted in the SPN data because it will be interpreted as the end of data indicator.

The delimiter character is not considered part of the data for the parameter. Consequently, the delimiter character is not included in the Data Length maximum byte length value in the SLOT definition. The delimiter is a mechanism within the PGN data content to denote the end of the parameter data for the variable length ASCII parameter. However, this fundamental perspective should not be seen as restricting how the parameter data is handled internally by an application.

Some examples of SPNs using a character delimited, variable length ASCII SLOT Types are SPNs 237 and 2902.

##### 5.2.1.7.1 SPN Data Definition for Character Delimited, Variable Length ASCII

An SPN using a Character Delimited, Variable Length ASCII SLOT Type has the following data definition characteristics:

- The 'Resolution' property indicates "ASCII"
- The 'Data Length' property indicates a variable length, such as "Variable - up to 200 characters"
- The 'Data Length' property indicates the delimiter character, such as "followed by an '\*' delimiter"

All ASCII characters, except for the delimiter character, are available for use in the SPN data with this type of ASCII SLOT. The delimiter character is not permitted in the SPN data for this type of ASCII SLOT because it will be interpreted as the end of data indicator. The asterisk (\*) character is the standard delimiter character for J1939 parameters of this SLOT type. There is a SLOT type that uses the NULL character (value 0) as the delimiter character. The SLOT type with

a NULL delimiter character is appropriate when there is a need to have the asterisk character available as a valid data character rather than a delimiter.

The 'Data Length' property defines the maximum length available for the ASCII data for the SPN. There is no minimum data length required for the data, unless the Data Length property explicitly states otherwise. The delimiter character is not included in the maximum data length value in the 'Data Length' property. The delimiter character is specified within the SLOT definition and SPN definition because it places a restriction on the allowed ASCII characters for the SPN data. It is included in the 'Data Length' property since this property appears in the PGN definition content.

The delimiter character is not considered part of the data for the parameter. This delimiter character perspective is not meant to restrict how the parameter data is handled internally by an application. An application may choose to include the delimiter as part of the parameter data within its memory storage; or alternately, an application may choose to add the delimiter as the parameter data is placed into the PGN data structure and to remove the delimiter as the parameter data is extracted from the PGN data structure and place into memory/storage. This fundamental perspective about the delimiter not being part of the parameter data is important when the SPN data is exchanged through means other than the PGN, such as through Memory Access Protocol with SPN spatial addressing. Since the delimiter character is not part of the parameter data, then the delimiter character shall not be included when exchanged through other means. For Memory Access Protocol, the content of the DM16 Binary Data Transfer PGN shall not include the delimiter character.

#### 5.2.1.7.2 PGN Data Field Details for Character Delimited, Variable Length ASCII

Within the PGN data field, the maximum data length defines the maximum number of bytes available for the ASCII data for this SPN in the data field position. The designated delimiter character shall immediately follow the last valid byte of ASCII data for the SPN in the PGN data field. The maximum data length does not define the required number of bytes for the data. A source application should not fill or pad the ASCII data for this type of SPN just to occupy the maximum length allowed. The delimiter character denotes the end of the data for the ASCII data SPN and indicates the starting position for a subsequent parameter. The delimiter is a mechanism within the PGN data content to denote the end of the parameter data for the variable length ASCII parameter.

The data for a subsequent parameter shall immediately follow the delimiter character.

The delimiter character is always required after a delimited variable length ASCII data field within the PGN data field, including situations when

- the delimited variable length ASCII parameter is not support by the source application
- the delimited variable length ASCII parameter is the only parameter in the data field
- the delimited variable length ASCII parameter data is zero (0) bytes or characters in length
- the delimited variable length ASCII parameter is the last parameter in the PGN data field
- the delimited variable length ASCII parameter data uses the maximum data length available for the SPN

It is not necessary to include ASCII text for a delimited Variable Length ASCII parameter; however, the delimiter is always required. In other words, it is acceptable to transmit zero-length ASCII text for a variable length ASCII parameter as long as the delimiter character is included in the PGN data.

The asterisk (\*) character is the standard delimiter character for J1939 parameters of this SLOT type. There is a SLOT type that uses the NULL character (Hex value 0) as the delimiter character. The SLOT type with a NULL delimiter character is appropriate when there is a need to have the asterisk character available as a valid data character rather than a delimiter.

Several examples are provided below to illustrate the PGN data field content for several situations. For these examples the letters 'a' through 'e' represent the data for 5 consecutive variable length ASCII parameters (asterisk \* delimited) within the PGN data field.

Example 1: Data provided for each parameter	aaaa*bbb*c*dddd*eee*
Example 2: Data only for parameters 'a' and 'b'	aaaaaaaa*bbbbbbbbbb****
Example 3: Data only for parameter 'a' and 'd'	*bbbbbbb*dddd**
Example 4: Data only for parameter 'e'	****e*****

#### 5.2.1.8 ASCII SLOT Type - Byte Count Delimited, Variable Length ASCII

The Byte Count Delimited, Variable Length ASCII SLOT Type defines an ASCII data parameter (SPN) with a varying number of ASCII characters in the data field, and relies upon a separate parameter (SPN) to report the ASCII data parameter byte length. The ASCII data SPN and the separate ASCII data byte length SPN must be transmitted in the same PGN, since it is possible for the length of the ASCII data to vary from one instance of the SPN data to another instance of the SPN data. All ASCII characters are permitted in the SPN data with this type of ASCII SLOT.

Special design considerations must be recognized by any application that is the source of a PGN with an SPN of the this ASCII SLOT type. One design consideration involves maintaining synchronization between the value for the associated Number of Bytes SPN and the length of the ASCII data SPN. Another design consideration involves the value reported for the Data Length SPN value if the ASCII parameter is not available or supported by the source.

Some examples of SPNs using a byte count delimited, variable length ASCII SLOT Type are SPNs 509 and 3075. SPN 509 is the ASCII data SPN and SPN 3070 reports the byte length of SPN 509. Similarly, SPN 3075 is the ASCII data SPN and SPN 3072 reports the byte length of SPN 3075.

##### 5.2.1.8.1 SPN Data Definition for Byte Count Delimited, Variable Length ASCII

An SPN using a Variable Length ASCII with Byte Count Parameter SLOT data type has the following data definition characteristics:

- The 'Resolution' property indicates "ASCII"
- The 'Data Length' property indicates a variable length, such as "Variable - up to 100 characters"
- The 'Data Length' property does not specify a delimiter character
- The Description Notes identify the Number of Bytes SPN that reports the ASCII data byte length

All ASCII characters are available for use in the ASCII data with this type of ASCII SLOT.

The 'Data Length' property defines the maximum length available for the ASCII data for the SPN. There is no minimum data length required for the ASCII data, unless the Data Length property explicitly states otherwise. A source application should not fill or pad the ASCII data for this type of SPN just to occupy the maximum length allowed.

##### 5.2.1.8.2 PGN Data Field Details for Byte Count Delimited, Variable Length ASCII

Within the PGN data field, the maximum data length defines the maximum number of bytes available for the ASCII data for this SPN in the data field position. The maximum data length does not define the required number of bytes for the data. A source application should not fill or pad the ASCII data for this type of SPN just to occupy the maximum length allowed.

The Number of Bytes SPN shall be positioned somewhere before the ASCII data SPN within the PGN data field to enable recipient applications to determine the end of the data for the ASCII data SPN. The source application must make sure the value in the Number of Bytes SPN is correct for the length of the instance of ASCII data SPN. The Number of Bytes SPN denotes the end of the ASCII data SPN and indicates the starting position for a subsequent parameter. The Number of Bytes SPN is the mechanism within the PGN data content to denote the end of the data for the variable length ASCII parameter.

The data for a subsequent parameter shall immediately follow the specified number of bytes after the starting byte position for the ASCII data SPN.

### 5.3 Application Notes

#### 5.3.1 Parameters with Multiple Sources

Each parameter received by a node for control purposes shall be configurable by the system integrator to identify the primary source of the data, as well as the secondary source, if applicable. It is to be expected that the system integrator configure each receiving device on a network identically. A secondary source of data is defined to be a device on the network that measures the data independently of the primary source of that data.

#### 5.3.2 Conventions for Parameter Placement Notation and Unspecified Bits in Message Definitions

This section explains the various notations used by J1939 documents to specify the position of parameter data within the PGN data field and illustrates the bit placement associated with the notations. This section also explains how to deal with the unspecified bits in the data field definition. The information in this section is intended to aid the reader in determining the proper placement of parameter data based upon the Start Position and Length attributes specified in the PGN definition. The information in this section is also intended to serve as a guide for how to properly define the Start Position attribute to define the placement of parameter data in a PGN.

#### 5.3.3 Terminology for Parameter Placement

##### 5.3.3.1 Parameter Data Length Classification Terminology

Three different classifications of parameters have been defined for the purposes of discussing parameter placement. The classifications are based upon the parameter data length. The three classifications are fractional byte length, integer byte length, and variable byte length. The 'Start Position' notation is explained according to each of the parameter data length classifications.

**Fractional Byte Length:** Term used to classify a parameter with a fixed data length where the data length is not an integer number of bytes. A parameter with a data length of 2 bits, a parameter with a data length of 5 bits, and a parameter with a data length of 10 bits are examples of fractional byte length parameters.

**Integer Byte Length:** Term used to classify a parameter with a fixed data length where the data length is an integer number of bytes. A parameter with a data length of 1 byte, a parameter with a data length of 2 bytes, and a parameter with a data length of 8 bits are examples of integer byte length parameters.

**Variable Byte Length:** Term used to classify a parameter with a variable data length that is an integer number of bytes. A parameter with a data length of "Variable - up to 200 characters" is an example of a variable byte length parameter. Alphanumeric or textual data parameters are the primary examples of variable byte length parameters.

##### 5.3.3.2 Start Position Terminology

The following terms are used throughout the parameter placement to describe the 'Start Position' notation style.

**Fixed:** Term used to describe a 'Start Position' notation that defines an absolute or fixed position for the placement of the parameter data in the data field. Some examples of fixed start position notations are '3', '5.4', '1-2', and '1.7-2',

**Equation:** Term used to describe a 'Start Position' notation that defines the placement of the parameter data using an equation rather than an absolute position. Equation start position notations are appropriate when the parameter data length is variable, when the PGN data field has multiple variable length parameters, or when there are fixed length parameters after variable length parameters in the data field. Some examples of equation start position notations are '14-n', '2 to n', '5 to A', and 'A+1 to B'.

**Field:** Term used to describe a 'Start Position' notation that defines the placement of the parameter data in terms of its relative sequence in the data field rather than with an absolute position or equation. Field start position notations are appropriate when the PGN data field has multiple consecutive variable length parameters in the

data field or the parameter is repeated in the data field. The placement order of fields follows the alphabetical sequence of the start positions. Some examples of field start position notations are 'a', 'b', and 'c'.

#### 5.3.3.3 Start Position Diagrams

Illustrations are included for many of the parameter placement notation styles to help clarify the parameter placement practices and the transmission order of the data over the J1939 data link. These illustrations include one or more of the following diagrams.

**Data Definition:** The Data diagram serves to illustrate the parameter data bits for the example data, shown where the data bits go highest order bit to lowest order significant bit in a left to right manner. Individual bits are identified with a 'b' followed by a number. The 'b' is the abbreviation for 'bit' and the number denotes the significance order of the bit, where bits with lower significance have a lower number value. This diagram serves as a convenient way of discussing bit placement for the J1939 data order practices. In the ASCII examples, the 'b' identifier may be preceded by a 'c' plus a number to designate the character instance.

**Placement:** The Placement diagram illustrates the placement of the parameter bits using a common view of data in memory, where the bytes go most significant to least significant in a left to right manner and the bits within a byte go highest order to lowest order in a left to right manner. This diagram serves as a convenient way of discussing bit placement for the J1939 data order practices.

**Transmission Order:** The Transmission Order diagram illustrates the parameter data bits in the order they are transmitted over the J1939 data link. As specified in J1939-21 Section 5.1.1, the data is transmitted in increasing byte order (i.e. byte 1, byte 2, byte 3, etc.) with the bits within a byte transmitted highest order bit first (i.e. bit 8, bit 7, bit 6, etc.).

#### 5.3.4 Guidelines for Parameter Placement

The following guidelines provide the basis for the parameter data placement conventions. These guidelines and the conventional parameter placement methods should be applied when defining the placement of parameters in PGNs.

1. Parameters with less than 8 bits should reside within a byte boundary
2. Parameters with more than 8 bits should either start or stop on a whole byte boundary
3. Only parameters with more than 8 bits should span a byte boundary
4. ASCII parameters, variable length parameters, and parameters with repeating data fields should start and stop on whole byte boundaries
5. Byte ordering rules are specified in 5.1.2 Message Format.

#### 5.3.5 Start Position Notation and Parameter Placement

The 'Start Position' specified for a parameter in the PGN definition and the 'Length' attribute of the parameter describes the placement of the parameter data into the PGN data field. Generally, the 'Start Position' notation reflects the bit position for the lowest order bit of the parameter data within the byte. When the parameter data is confined to a single byte, then the 'Start Position' consists of one numerical value declaring the position for the lowest order bit of the parameter data. When the parameter data spans one or more byte boundaries, then the 'Start Position' consists of two numerical values; each declaring the position for the lowest order bit of the parameter data in the lowest and highest order bytes. For numerical start position notation, the integer value identifies the byte and the decimal value identifies the bit position (1 to 8, with 1 as the lowest order bit) within the byte. When the start position value does not include a decimal value, then the parameter data consumes the entire byte.

The 'Start Position' notation has several formats to accommodate the different parameter data length types and the different parameter placement needs. For the purposes of parameter placement discussion, parameter data length is classified as fractional byte length (2 bits, 4 bits, 10 bits, etc.), integer byte length (1 byte, 2 byte, etc.), and variable byte length. Each of these parameter length classifications have different requirements when it comes to specifying the position data field position of the data. This section explains the 'Start Position' notation according to each of the parameter data length classifications.

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### 5.3.6 Start Position Notation for Fractional Byte Length Parameters

Fractional byte length parameters are parameters with a data length that is not an integer number of bytes, e.g. 2 bits, 5 bits, 10 bits, etc. The information in Table 5 presents the 'Start Position' notations used with fractional byte length parameters and explains the respective parameter placement. Figure 4 through Figure 8 show examples of these 'Start Position' notations and illustrate the parameter placement.

The following guidelines explain how to determine data placement from the 'Start Position' and 'Length' attributes for a parameter with Fractional Byte Length data.

1. In the Start Position notation, the number before the decimal point identifies the byte and the number after the decimal point identifies the bit position within that byte.
2. If the data length is less than 1 byte and all data bits are within the same byte, then the Start Position consists of one numerical value.
3. If the data length is larger than 1 byte or the data spans a byte boundary, then the Start Position consists of two numerical values separated by a comma or dash. The number before the comma or dash is the first position designation and the number after the comma or dash is the second position designation.
4. If a position designation in the Start Position does not have a decimal value, then the start bit is at bit 1 (one) in that byte. For example, a position designation of '2' is equivalent to the position designation '2.1'. This abbreviated style is only used when the data occupies the whole byte. In Table 5, a designation of "R" is equivalent to the designation "R.1", and a designation of "S" is equivalent to the designation "S.1". This is illustrated in Figure 6 through Figure 8. In Figure 6, the second position designation is '2', so the lowest order data bit placed into byte 2 will be positioned at bit 1.
5. For fractional byte length data, the least significant data bit is always positioned at the first position designation, and each next higher order data bit is placed into the next higher order data field bit position. In Table 5, "R.x" represents the first position designation, so the least significant bit of the data is placed at bit 'x' of byte 'R', the next higher order bit of the data is placed at bit 'x+1' of byte 'R', etc. This is illustrated in Figure 4 through Figure 8.
6. When higher order data bit placement reaches a byte boundary and the next higher data field byte is an intermediate byte between the bytes specified in the first and second position designations, then the next higher order data bit is placed at bit 1 of the next higher order data field byte and additional higher order data bits are placed in next higher order fashion from that point. This is illustrated in Figure 8. In Figure 8, the Start Position notation identifies byte 6 in the first position designation and byte 8 in the second position designation, so byte 7 is an intermediate byte. When bit placement reaches byte 7, the next higher order data bit (bit 'b9'), is placed at bit 1 of byte 7 and the next higher order data bits are placed into byte 7 in next higher order fashion from that point.
7. When higher order data bit placement reaches a byte boundary and the next higher data field byte is the byte identified in the second position designation in the Start Position, then the number after the decimal in the second position designation indicates the bit position in that byte where the next higher order data bit is placed in the byte and any remaining higher order data bits are to be placed in next higher order fashion from that point. In Table 5, "S.w" represents the second position designation, so when data bit placement reaches byte 'S' of the data field, the next higher order bit of the data is placed at bit 'w' of byte 'S', the next higher order bit of data after that is placed at bit 'w+1' of byte 'S', etc. This is illustrated in Figure 5, Figure 7, and Figure 8. In Figure 8, the second position designation is '8.6'. When bit placement gets to byte 8, then next higher order data bit, bit 'b17', is placed at bit 6 of byte 8 and the last two bits, 'b18' and 'b19', are placed at bit 7 and bit 8 of byte 8, respectively.



TABLE 5 - START POSITION NOTATION FOR FRACTIONAL BYTE LENGTH PARAMETERS

Start Position	Length	Interpretation	Example Illustration
R.x	Y bits (Y less than 8)	Fixed position of the data within a byte boundary for a fractional byte length parameter with less than 8 bits. The parameter occupies 'Y' number of bits of byte 'R' with the least significant bit of the parameter data at bit 'x' in byte 'R' and the most significant bit of the parameter data is at bit ('x' + ('Y'-1)) in byte 'R'.	Figure 4
R.x-S.w	Y bits (Y less than 8)	Fixed position of the data across a byte boundary for a fractional byte length parameter with less than 8 bits. The parameter occupies the most significant bits of byte 'R' from bit 'x' to bit 8 and the remaining number of data bits start from bit 'w' in byte 'S'. The least significant bit of the parameter data is placed at bit 'x' in byte 'R'.	Figure 5
R.x-S	Y bits (Y greater than 8)	Fixed position of a fractional byte length parameter with more than 8 bits where the data crosses a byte boundary and stops on a whole byte. The parameter occupies the most significant bits of byte 'R' from bit 'x' to bit 8 plus all whole bytes up to 'S'.	Figure 6
R-S.w	Y bits (Y greater than 8)	Fixed position of a fractional byte length parameter with more than 8 bits where the data crosses a byte boundary and starts on a whole byte. The parameter occupies all whole bytes from 'R' up to 'S' and the remaining modulo-8 number of bits starting from bit 'w' in byte 'S'.	Figure 7, Figure 8**

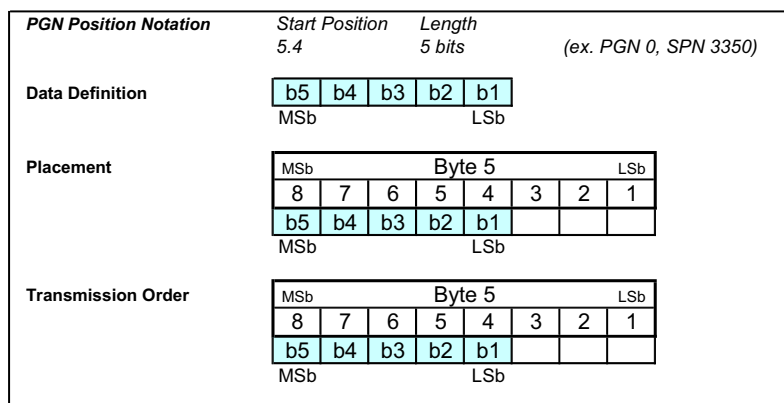


FIGURE 4 - FRACTIONAL BYTE (LESS THAN 1 BYTE) WITHIN BYTE BOUNDARY

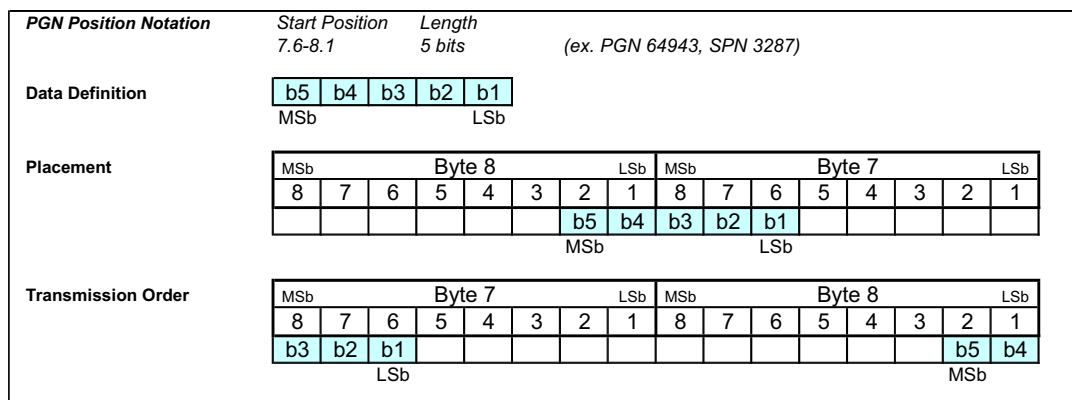


FIGURE 5 - FRACTIONAL BYTE (LESS THAN 1 BYTE) ACROSS BYTE BOUNDARY

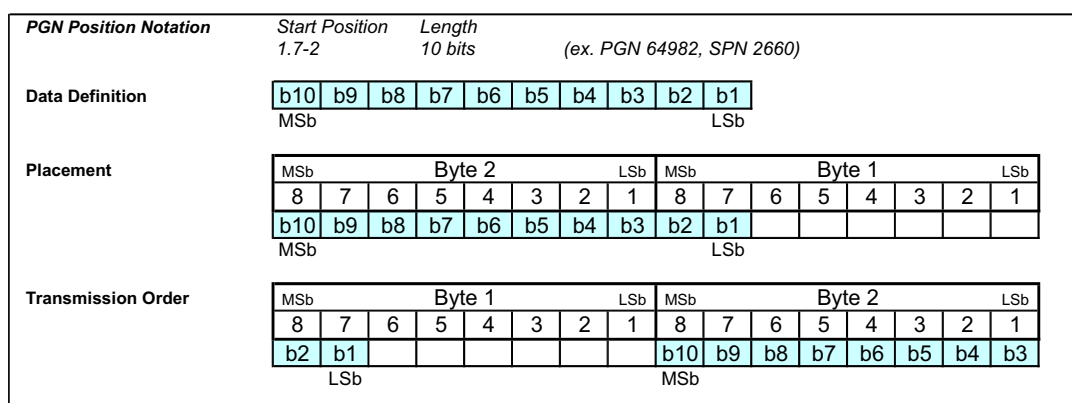


FIGURE 6 - FRACTIONAL BYTE (LARGER THAN 1 BYTE) ENDING ON BYTE BOUNDARY

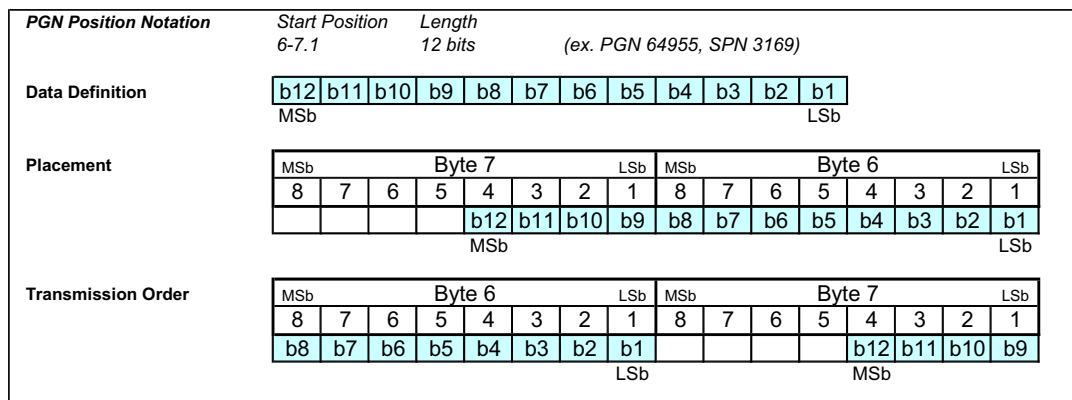


FIGURE 7 - FRACTIONAL BYTE (LARGER THAN 1 BYTE) STARTING ON BYTE BOUNDARY

PGN Position Notation

Start Position

6-8.6

Length

19 bits

(ex. PGN 49920, SPN 3036)

Data Definition

b19	b18	b17	b16	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1
MSb										LSb								

Placement

MSb								Byte 8								LSb	MSb								Byte 7								LSb	MSb								Byte 6								LSb
8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1																			
b19	b18	b17						b16	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1																											
MSb																								LSb																										

Transmission Order

MSb								Byte 6								LSb	MSb								Byte 7								LSb	MSb								Byte 8								LSb
8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1																			
b8	b7	b6	b5	b4	b3	b2	b1	b16	b15	b14	b13	b12	b11	b10	b9	b19	b18	b17																																

**\*\* Note:** This placement method is used in the various Diagnostics Messages in J1939-73 when passing the SPN number in the data field. The use of this fractional byte placement model should be limited to passing the SPN number in the DMx messages.

FIGURE 8 - FRACTIONAL BYTE (LARGER THAN 1 BYTE) STARTING ON BYTE BOUNDARY

### 5.3.7 Start Position Notation for Integer Byte Length Parameters

The information in Table 66 and Table 7 presents 'Start Position' notations used with parameters with integer byte length. Examples of these 'Start Position' notations are illustrated in Figure 9 through Figure 12. Integer byte length parameters are parameters with a fixed data length in whole bytes, e.g. 1 byte, 2 bytes, 4 bytes, 16 bits, etc. The placement of the data bytes for integer byte length parameters larger than 1 byte depends upon whether the parameter is non-alphanumeric (e.g. scaled data or state list) or alphanumeric. As noted in 5.1.2 Message Format, the placement or ordering of the data bytes for multiple byte parameters differs between alphanumeric and all other data types. The parameter definition must be referenced to determine if the parameter is non-alphanumeric or alphanumeric data.

TABLE 6 - START POSITION NOTATION FOR INTEGER BYTE LENGTH PARAMETERS (NON-ALPHANUMERIC)

Start Position	Length	Interpretation	Example Illustration
R	1 byte or 8 bits	Fixed position of a one byte data parameter within a whole byte. The parameter occupies the entire byte 'R'.	Figure 9
R-S R, S R	Y bytes or 16 bits	Fixed position of a multiple byte data. Since this parameter is non-alphanumeric data (based upon parameter definition), the data is positioned so the Least Significant Byte is transmitted first, per 5.1.2. The parameter occupies 'Y' number of bytes from byte 'R' through byte 'S'.	Figure 10, Figure 11

TABLE 7 - START POSITION NOTATION FOR INTEGER BYTE LENGTH PARAMETERS (ALPHANUMERIC)

Start Position	Length	Interpretation	Example Illustration						
R	1 byte or 8 bits	Fixed position of a one byte data parameter within a whole byte. The parameter occupies the entire byte 'R'.	Figure 9						
R-S	Y bytes	Fixed position of a multiple byte data. Since this parameter is alphanumeric data (based upon parameter definition), the data is positioned so the Most Significant Byte is transmitted first, per 5.1.2. The parameter occupies 'Y' number of bytes from byte 'R' through byte 'S'.	Figure 12						
'n'	Y bytes	<p>Field position of a multiple byte data. Since this parameter is alphanumeric data (based upon parameter definition), the data is positioned so the Most Significant Byte is transmitted first, per 5.1.2. The parameter occupies 'Y' number of bytes from the point that the field starts (i.e. in the first byte following the previous field).</p> <p>Example (PGN 64912, SPN 3560 and 3561)</p> <table><tr><td>Start Position</td><td>Length</td></tr><tr><td>a</td><td>2 bytes (SPN 3560)</td></tr><tr><td>b</td><td>2 bytes (SPN 3561)</td></tr></table> <p><i>The structure of these two parameters repeats in the data field. The 2 bytes of data for SPN 3561 (field 'b') is placed in the 2 bytes following the last byte of SPN 3560 (field 'a').</i></p>	Start Position	Length	a	2 bytes (SPN 3560)	b	2 bytes (SPN 3561)	
Start Position	Length								
a	2 bytes (SPN 3560)								
b	2 bytes (SPN 3561)								

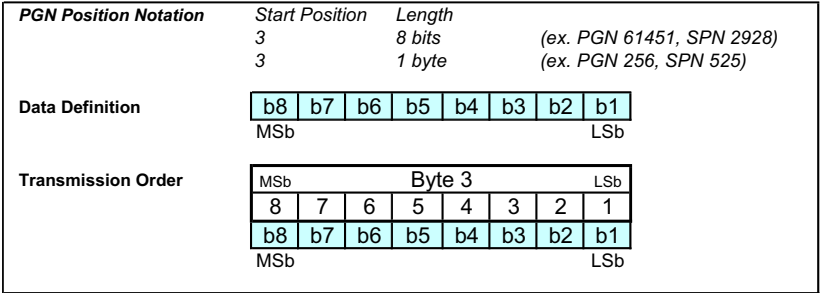


FIGURE 9 - SINGLE BYTE DATA PLACEMENT (NON-ALPHANUMERIC AND ALPHANUMERIC)

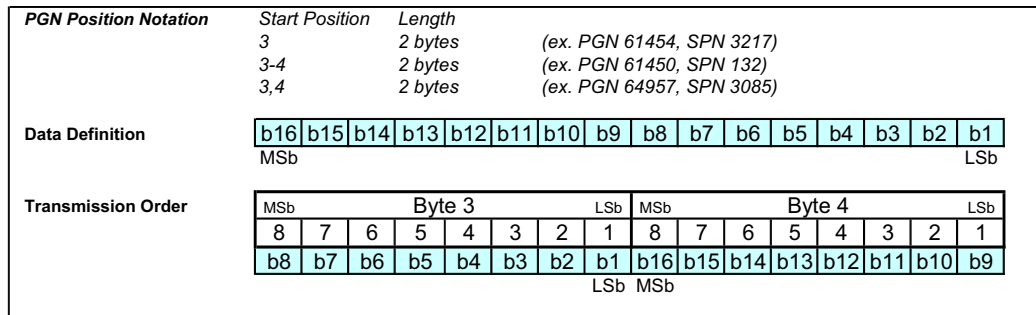


FIGURE 10 - MULTIPLE BYTE PLACEMENT (NON-ALPHANUMERIC DATA)

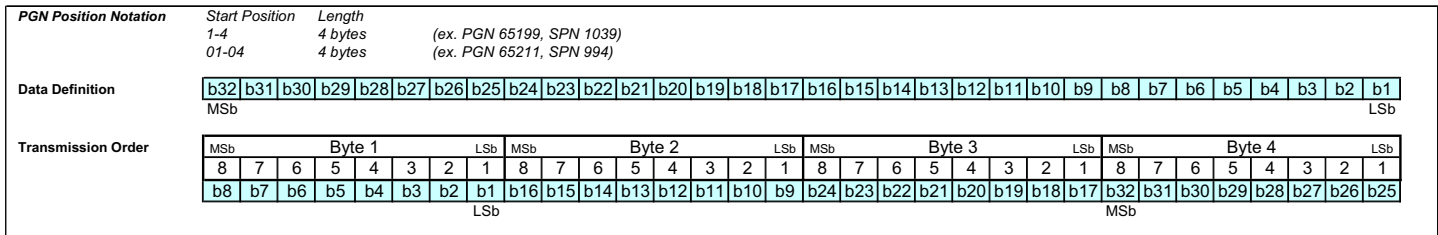


FIGURE 11 - MULTIPLE BYTE PLACEMENT (NON-ALPHANUMERIC DATA)

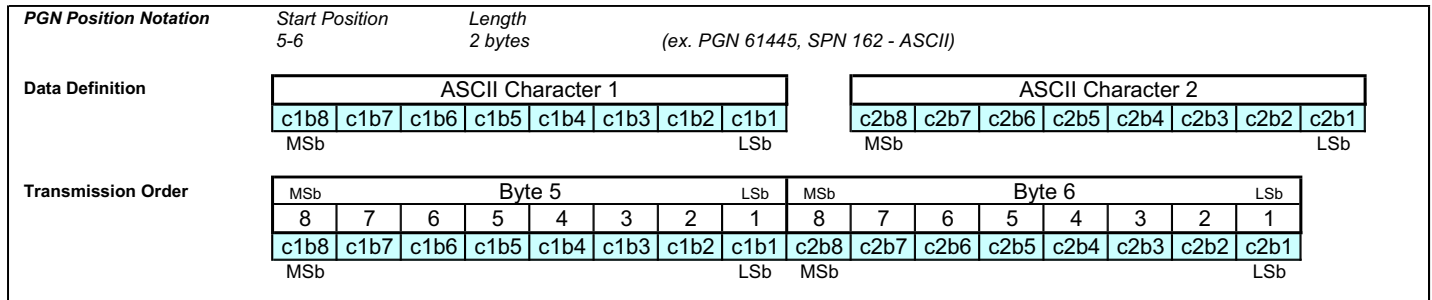


FIGURE 12 - MULTIPLE BYTE PLACEMENT (ALPHANUMERIC DATA)

### 5.3.8 Start Position Notation for Variable Length Parameters

The information in Table 8 present 'start position' notations used with variable length parameters. Alphanumeric or textual data parameters are the primary examples of variable byte length parameters. The 'starting position' is typically denoted using letters and equations to explain the position of the content within the message data field.

TABLE 8 - START POSITION NOTATION FOR VARIABLE LENGTH PARAMETERS

Start Position	Length	Interpretation										
R-'N'	Variable – up to Y characters ("*" delimited)	<p>The parameter starts at byte 'R' and continues through some variable number of bytes where the end is denoted by an asterisk character in the data stream. The length of the parameter does not include the "*" delimiter.</p> <p>Example (PGN 65242, SPN 234)</p> <table><tr><td>Start Position</td><td>Length</td></tr><tr><td>2-N</td><td>Variable - up to 200 characters ("*" delimited)</td></tr></table> <p><i>Parameter starts at byte 2 and continues up to the asterisk character (at byte 203 at the highest).</i></p>	Start Position	Length	2-N	Variable - up to 200 characters ("*" delimited)						
Start Position	Length											
2-N	Variable - up to 200 characters ("*" delimited)											
R to 'N'	Variable – up to Y characters	<p>Equations define the starting position of two consecutive variable length parameters. The first parameter starts at byte 'R' and continues through some variable number of bytes. And the second parameter starts at the first byte last character of the first parameter and continues through some variable number of bytes.</p> <p>Example (PGN 64958, SPNs 3074 and 3075)</p> <table><tr><td>Start Position</td><td>Length</td></tr><tr><td>2</td><td>1 byte (Number of bytes in SPN 3074)</td></tr><tr><td>3</td><td>1 byte (Number of bytes in SPN 3075)</td></tr><tr><td>5 to A</td><td>Variable - up to 100 characters (SPN 3074)</td></tr><tr><td>A+1 to B</td><td>Variable - up to 100 characters (SPN 3075)</td></tr></table> <p><i>First variable length parameter starts at byte 5 and continues through the number of bytes specified in Byte 2. The second variable length parameter starts at first byte after SPN 3074 data and continues through the number of bytes specified in Byte 3.</i></p>	Start Position	Length	2	1 byte (Number of bytes in SPN 3074)	3	1 byte (Number of bytes in SPN 3075)	5 to A	Variable - up to 100 characters (SPN 3074)	A+1 to B	Variable - up to 100 characters (SPN 3075)
Start Position	Length											
2	1 byte (Number of bytes in SPN 3074)											
3	1 byte (Number of bytes in SPN 3075)											
5 to A	Variable - up to 100 characters (SPN 3074)											
A+1 to B	Variable - up to 100 characters (SPN 3075)											
'N'+1 to 'P'	Variable – up to Y characters											
'n'	Variable – up to Y characters ("*" delimited)	<p>Field position of a variable length data parameter. The parameter is the nth ordered field. The parameter occupies the first data byte following the previous parameter and continues some variable number of bytes where the end is denoted by an asterisk character in the data stream. The length of the parameter does not include the "*" delimiter.</p> <p>Example (PGN 64965, SPN 2903)</p> <table><tr><td>Start Position</td><td>Length</td></tr><tr><td>c</td><td>Variable - up to 200 characters ("*" delimited)</td></tr></table> <p><i>Parameter is the 3rd field and continues up to the asterisk delimiter character (201 bytes beyond start of 3rd field at the highest). The starting byte number depends upon the length of the data before this field.</i></p>	Start Position	Length	c	Variable - up to 200 characters ("*" delimited)						
Start Position	Length											
c	Variable - up to 200 characters ("*" delimited)											

### 5.3.9 Unspecified Bits in the PGN Data Field Definition

Unspecified bits are the bits within the PGN data field byte length that are not assigned to a parameter or are not used by the data for the collection of parameters (SPNs) in the PGN. In the J1939 PGN definitions, the unspecified bits are typically not shown or explicitly identified in the PGN definition.

The 'Data Length' property of the PGN definition specifies the minimum and maximum byte length of the data field for the PGN. The transmitted data field must be at least the minimum length specified by the 'Data Length' property for the PGN, and all unspecified bit within the transmitted data field must be filled with a value of one (1). This standard makes it possible to assign unspecified bits to parameters at some future time.

### 5.3.9.1 Unspecified Bits Example using PGN 65213

An example of unspecified bits is provided in Figure 13 using PGN 65213. The top section of Figure 13 shows the PGN Data Length and PGN content definition for PGN 65213. There are 36 Unspecified Bits in the PGN definition in this example. The unspecified bits are bit 5 to bit 8 of byte 2 (4 bits total) and all bits in byte 4 through byte 8 (32 bits total).

The PGN definition indicates SPN 975 is a 1 byte parameter with a data start position at byte 1. Since SPN 975 occupies all the bits in byte 1, there are no unspecified bits in byte 1. Next, the PGN definition indicates SPN 977 is a 4 bit parameter with a starting position of '2.1' which means the data for SPN 977 occupies bit 1 to bit 4 of byte 2. The next parameter in the PGN definition has a starting position in byte 3, which means bit 5 through bit 8 of byte 2 are Unspecified Bits. The third parameter in the PGN definition indicates SPN 1639 is a 2 byte parameter with a data start position of '3-4'. Since SPN 1639 occupies all the bits in bytes 3 and 4, there are no unspecified bits in byte 3 or byte 4. Finally, the PGN 'Data Length' property indicates the PGN has a message data field length of 8 bytes, but the PGN definition only lists parameter content through byte 4. All of the bits in byte 5 through byte 8 are Unspecified Bits. When transmitted, the message data field for this PGN must be 8 bytes in length, as specified by the PGN Data Length property. The 36 Unspecified Bits must be filled each with a one (1), and the other 28 bits for the data for SPNs 975, 977, and 1639 must be filled appropriately.

PGN 65213 Fan Drive – FD																																																																																																																																																															
Data Length: 8																																																																																																																																																															
Start Position	Length	Parameter Name	SPN																																																																																																																																																												
1	1 byte	Estimated Percent Fan Speed	975																																																																																																																																																												
2.1	4 bits	Fan Drive State	977																																																																																																																																																												
3-4	2 bytes	Fan Speed	1639																																																																																																																																																												
Transmission Order																																																																																																																																																															
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FIGURE 13 - UNSPECIFIED BITS EXAMPLE

## 6. NOTES

### 6.1 Marginal Indicia

The (R) located in the left margin is for the convenience of the user in locating areas where technical revisions, not editorial changes, have been made to the previous issue of this document. An (R) symbol to the left of the document title indicates a complete revision of the document, including technical revisions. (R) is not used in original publications, nor in documents that contain editorial changes only.

PREPARED BY THE SAE TRUCK AND BUS CONTROL AND COMMUNICATIONS NETWORK  
COMMITTEE OF THE SAE TRUCK AND BUS ELECTRICAL AND ELECTRONICS STEERING COMMITTEE

## APPENDIX A SLOTS

	SLOT Name	SLOT Type	Scaling	Range	Offset	Length	SLOT Identifier
	Diagnostic						202
	SAEac01	Acceleration	1/2048 m/s <sup>2</sup> per bit	-15.687 to +15.687 m/s <sup>2</sup>	-15.687 m/s <sup>2</sup>	2 bytes	115
	SAEac02	Acceleration	0.1 m/s <sup>2</sup> per bit	-12.5 to +12.5 m/s <sup>2</sup>	-12.5 m/s <sup>2</sup>	1 byte	140
(R)	SAEac03	Acceleration	0.01 m/s <sup>2</sup> per bit	-320 to +322.55 m/s <sup>2</sup>	-320 m/s <sup>2</sup>	2 bytes	303
	SAEad01	Angle/Direction	10 <sup>-7</sup> deg/bit	-210 to 211.1008122 deg	-210 deg	4 bytes	7
	SAEad02	Angle/Direction	0.1 sec/bit	-3276.8 to 3148.7 sec	-3,276.8 sec	2 bytes	10
	SAEad03	Angle/Direction	1/1024 rad per bit	-31.374 to +31.374 rad	-31.374 rad	2 bytes	113
	SAEad04	Angle/Direction	1/128 deg/bit	-200 to 301.99 deg	-200 deg	2 bytes	8
	SAEad05	Angle/Direction	1/128 deg/bit	0 to 501.99 deg	0	2 bytes	9
	SAEad06	Angle/Direction	1 deg/bit	-125 to 125 deg	-125 deg	1 byte	11
	SAEad07	Angle/Direction	1/256 deg/bit	-125 to 125 deg	-125 deg	2 bytes	136
	SAEad08	Angle/Direction	0.002 deg/bit	-64 to 64.51 deg	-64	2 bytes	242
	SAEad09	Angle/Direction	0.1 deg/bit	-12.5 to 12.5 deg	-12.5 deg	1 byte	244
	SAEad10	Angle/Direction	0.5 deg/bit	-65 to 60 deg	-65 deg	1 byte	248
	SAEad11	Angle/Direction	1/32768 deg/bit	-250 to 250.9999 deg	-250 deg	3 bytes	294
(R)	SAEatad0005	ASCII, text (variable, "" delimited)	ASCII	0 to 255 per byte	0	Variable - up to 5 bytes followed by an "" delimiter	109
(R)	SAEatad0025	ASCII, text (variable, "" delimited)	ASCII	0 to 255 per byte	0	Variable - up to 25 bytes followed by an "" delimiter	271
(R)	SAEatad0032	ASCII, text (variable, "" delimited)	ASCII	0 to 255 per byte	0	Variable - up to 32 bytes followed by an "" delimiter	291
(R)	SAEatad0200	ASCII, text (variable, "" delimited)	ASCII	0 to 255 per byte	0	Variable - up to 200 bytes followed by an "" delimiter	108
(R)	SAEatad1728	ASCII, text (variable, "" delimited)	ASCII	0 to 255 per byte	0	Variable - up to 1728 bytes followed by an "" delimiter	111
(R)	SAEatf0001	ASCII, text (fixed length)	ASCII	0 to 255 per byte	0	1 byte	94
(R)	SAEatf0002	ASCII, text (fixed length)	ASCII	0 to 255 per byte	0	2 bytes	131
(R)	SAEatf0004	ASCII, text (fixed length)	ASCII	0 to 255 per byte	0	4 bytes	212
(R)	SAEatf0005	ASCII, text (fixed length)	ASCII	0 to 255 per byte	0	5 bytes	273
(R)	SAEatf0007	ASCII, text (fixed length)	ASCII	0 to 255 per byte	0	7 bytes	110
(R)	SAEatf0016	ASCII, text (fixed length)	ASCII	0 to 255 per byte	0	16 bytes	282
(R)	SAEatnd0200	ASCII, text (variable, NULL delimited)	ASCII	0 to 255 per byte	0	Variable - up to 200 bytes followed by an NULL delimiter	258
(R)	SAEatvn0100	ASCII, text (variable, non-delimited)	ASCII	0 to 255 per byte	0	Variable - up to 100 bytes	228
	SAEba01	Brake Applications	1 brake appl/bit	0 to 4,227,858,431 appl	0	4 bytes	81
	SAEbm05	Bit mapped	5 bit bit-mapped	bit-mapped	0	5 bits	292



SLOT Name	SLOT Type	Scaling	Range	Offset	Length	SLOT Identifier
SAEbm08	Bit mapped	8 bit bit-mapped	bit-mapped	0	8 bits	275
SAEbm16	Bit mapped	16 bit bit-mapped	bit-mapped	0	16 bits	276
SAEbm64	Bit mapped	64 bit bit-mapped	bit-mapped	0	64 bits	278
SAEbs01	Bit Field	2 states/1 bit	0 to 1	0	1 bit	86
SAEbs02	Bit Field	4 states/2 bit	0 to 3	0	2 bits	87
SAEbs03	Bit Field	8 states/3 bit	0 to 7	0	3 bits	88
SAEbs04	Bit Field	16 states/4 bit	0 to 15	0	4 bits	89
SAEbs05	Bit Field	32 states/5 bit	0 to 31	0	5 bits	90
SAEbs06	Bit Field	64 states/6 bit	0 to 63	0	6 bits	91
SAEbs07	Bit Field	128 states/7 bit	0 to 127	0	7 bits	92
SAEbs08	Bit Field	256 states/8 bit	0 to 255	0	8 bits	93
SAEbs11	Bit Field	2047 states/11bit	0 to 2047	0	11 bits	218
SAEbs12	Bit Field	4095 states/12bit	0 to 4095	0	12 bits	281
SAEbs21	Bit Field	2097151 states/21bit	0 to 2097151	0	21 bits	217
SAEbs24	Bit Field	16777215 states/24bit	0 to 16777215	0	24 bits	280
SAEbs32	Bit Field	4294967296 states/32bit	0 to 4294967296	0	32 bits	245
SAEby01	Number of bytes	1 byte/bit	0 to 250 bytes	0	1 byte	239
SAEca01	Capacity, Battery	1 mAh/bit	0 to 64255mAh (64.255Ahr)	0	2 bytes	211
SAEcb01	Control byte	1 count/bit	0 to 255	0	1 byte	120
SAEcd01	Calendar, days	0.25 days/bit	0 to 62.5 days	0	1 byte	60
SAEcm01	Calendar, months	1 month/bit	0 to 250 months	0	1 byte	62
SAEco01	Conductivity	5 microSiemens/mm	0 to 1250 microSiemens/mm	0	1 byte	255
SAEct01	Count	1 turn/bit	-32 to 29 turns	-32 turns	6 bits	141
SAEct02	Count	1 count/bit	0 to 250	0	1 byte	129
SAEct03	Count	1 count/bit	0 to 255	0	1 byte	133
SAEct04	Count	1 count/bit	0 to 64,255 counts	0	2 bytes	12
SAEct05	Count	1 count/bit	0 to 65,535 counts	0	2 bytes	208
SAEct06	Count	1 count/bit	0 to 16,777,216 counts	0	3 bytes	207
SAEct07	Count	1 count/bit	0 to 4,294,967,295 counts	0	4 bytes	209
SAEct08	Count	1 count/bit	0 to 15	0	4 bits	220
SAEct09	Count	1 count/bit	-125 to 125 counts	-125	1 byte	230
SAEct10	Count	1 count/bit	0 to 31	0	5 bits	232
SAEct11	Count	1 count/bit	0 to 4095	0	12 bits	233
SAEct12	Count	1 count/bit	0 to 127	0	7 bits	260
SAEcw01	Calendar, weeks	1 week/bit	-125 to 125 weeks	-125 weeks	1 byte	65
SAEcy01	Calendar, years	1 year/bit	1985 to 2235 years	1985 years	1 byte	66
SAEcy02	Calendar, years	1 year/bit	2000 to 2061 years	2000 years	6 bits	284
SAEde01	Dielectricity	0.1/bit	0 to 25.0	0	1 byte	139
(R) SAEde02	Dielectricity	1/8192 per bit	0 to 7.844	0	2 bytes	307
SAEdn01	Density	0.08 g/L per bit	0 to 20.0 g/L	0	1 byte	287
(R) SAEdn02	Density	0.0003052 g/cc per bit	0 to 1.961 g/cc	0	2 bytes	302
SAEds02	Distance	100 mm/bit	-209.7152 to 211.3929215 m	-209.7152 m	4 bytes	142
SAEds03	Distance	0.1 mm/bit	-3,200 to 3,225.5 mm	-3,200 mm	2 bytes	13
SAEds04	Distance	0.1 mm/bit	0 to 6,425.5 mm (0 to 6.4255 m)	0	2 bytes	14
SAEds05	Distance	0.001 m/bit	0 to 4,211,081.215 m	0	4 bytes	126
SAEds06	Distance	0.125 m/bit	-2500 to 5531.875 m	-2500 m	2 bytes	39
SAEds07	Distance	1 m/bit	0 to 250 m	0	1 byte	95
SAEds08	Distance	1 m/bit	-125 to 125 m	-125 m	1 byte	15
SAEds09	Distance	5 m/bit	0 to 21,055,406 km	0	4 bytes	38
SAEds10	Distance	0.125 km/bit	0 to 526,385,151.9 km	0	4 bytes	36
SAEds11	Distance	5 km/bit	-160,635 to 160,640 km	-160,635 km	2 bytes	37
SAEds12	Distance	1 mm/bit	0 to 64,255 mm	0	2 bytes	231
SAEds13	Distance	10 mm/bit	0 to 2500 mm (0 to 2.500 m)	0	1 byte	234
(R) SAEs14	Distance	1 mm/bit	-32000 to 32255 mm (-32.000 to 32.255 m)	-32000 mm	2 bytes	235
SAEds15	Distance	1 km/bit	0 to 64,255 km	0	2 bytes	270

	SLOT Name	SLOT Type	Scaling	Range	Offset	Length	SLOT Identifier
(R)	SAEdv01	Dynamic viscosity	0.015625 Cp per bit	0 to 1003.984375 Cp	0	2 bytes	301
	SAEec01	Electrical Current	0.05 A/bit	-1600 to 1612.75 A	-1600 A	2 bytes	104
	SAEec02	Electrical Current	1 A/bit	-125 to 125 A	-125 A	1 byte	40
	SAEec03	Electrical Current	1 A/bit	0 to 250 A	0	1 byte	41
	SAEec04	Electrical Current	1 A/bit	0 to 64,255 A	0	2 bytes	146
	SAEec05	Electrical Current	0.05 A/bit	0 to 3212.75 A	0	2 bytes	250
	SAEec06	Electrical Current	0.001 A/bit	0 to 64.255 A	0	2 bytes	143
	SAEeg01	Economy, gaseous	1/512 km/kg per bit	0 to 125.5 km/kg	0	2 bytes	17
	SAEel01	Economy, liquid	1/512 km/L per bit	0 to 125.5 km/L	0	2 bytes	16
	SAEen01	Energy	1 kWh/bit	0 to 4211081215 kWh	0	4 bytes	150
	SAEer01	Energy, reactive	1 kVArh/bit	0 to 4211081215 kVArh	0	4 bytes	257
	SAEev01	Electrical Voltage	0.05 V/bit	0 to 3212.75 V	0	2 bytes	80
	SAEev02	Electrical Voltage	1 V/bit	0 to 64,255 V	0	2 bytes	145
	SAEev03	Electrical Voltage	0.01 V/bit	0 to 642.55 V	0	2 bytes	221
	SAEev04	Electrical Voltage	0.05 V/bit	-1606.00 to 1606.75 V	-1606.00 V	2 bytes	249
	SAEev05	Electrical Voltage	1/128 V/bit	0 to 32,899,071 V	0	4 bytes	252
	SAEfg01	Flow rate, gaseous	0.05 kg/h per bit	0 to 3212.75 kg/h	0	2 bytes	18
	SAEfg02	Flow rate, gaseous	0.2 kg/h per bit	0 to 12851 kg/h per bit	0	2 bytes	262
	SAEfl01	Flow rate, liquid	0.05 L/h per bit	0 to 3,212.75 L/h	0	2 bytes	42
	SAEfm00	FMI	Binary	0 to 31	0	5 bits	215
	SAEfm01	Flow rate, mass	0.3 g/h per bit	0 to 19276.5 g/h	0	2 bytes	272
	SAEfq01	Frequency	1/128 Hz/bit	0 to 501.9921875 Hz	0	2 bytes	144
	SAEfr01	Force	5 N/bit	0 to 321,275 N	0	2 bytes	43
	SAEfr02	Force	10 N/bit	-320,000 to 322,550 N	-320,000 N	2 bytes	127
	SAEfr03	Force	1000 N/bit	-100 kN to 150 kN	-100 kN	1 byte	135
	SAEfug01	Fuel Used, gaseous	0.5 kg/bit	0 to 2,105,540,607.5 kg	0	4 bytes	21
	SAEful01	Fuel Used, liquid	0.5 L/bit	0 to 2,105,540,607.5 L	0	4 bytes	20
	SAEful02	Fuel Used, liquid	0.001 L/bit	0 to 4,211,081.215 L	0	4 bytes	300
	SAEfv01	Flow rate, volumetric	0.1 m^3/h per bit	0 to 6425.5 m^3/h	0	2 bytes	19
	SAEgf01	Group Function	1 count/bit	0 to 255	0	1 byte	121
	SAEgg01	Governor gain	1/1280 %/rpm per bit	0 to 50.2 %/rpm	0	2 bytes	22
	SAEgr01	Gear Ratio	0.01/bit	0 to 642.55	0	2 bytes	23
	SAEgv01	Gear Value	1 gear value/bit	-125 to 125	-125	1 byte	24
	SAEgv02	Gear Value	1 gear value/bit	0 to 250	0	1 byte	101
	SAEid01	Identifier, component/software	1 ID/bit	0 to 250 ID	0	1 byte	25
	SAEie01	Inertia	0.004 kg-m^2/bit	0 to 257.02 kg-m^2	0	2 bytes	112
	SAEio01	Intensity, optical	0.4 mW/cm^2 per bit	0 to 100 mW/cm^2	0	1 byte	204
	SAEkv01	Kinematic viscosity	1 mm^2/s per bit	0 to 250 mm^2/s	0	1 byte	26
	SAElg01	Lambda signal gain	0.5%/bar per bit	0 to 125%/bar	0	1 byte	297
	SAEma01	Mass	4 g/bit	0 to 1000 g	0	1 byte	286
	SAEmc01	Mass, cargo	0.5 kg/bit	0 to 32,127.5 kg	0	2 bytes	27
	SAEmc02	Mass, cargo	2 kg/bit	0 to 128,510 kg	0	2 bytes	28
	SAEmc03	Mass, cargo	10 kg/bit	0 to 642,550 kg	0	2 bytes	29
	SAEmc04	Mass, cargo	0.10 kg/bit	0 to 6425.5 kg	0	2 bytes	226
	SAEmc05	Mass, cargo	0.10 g/bit	0 to 6425.5 g	0	2 bytes	227
	SAEmc06	Mass, cargo	2 kg/bit	0 to 32,899,070 kg	0	3 bytes	122
	SAEmc07	Mass, cargo	2 kg/bit	-16,449,535 to 16,449,535 kg	-16,449,535	3 bytes	267
	SAEmd01	Manufacturer defined	0 to 255 per byte	manufacturer defined	manufacturer defined	Variable	283
	SAEnm01	Name (long)	1 count/bit	0 to (2^64 - 1)	0	8 bytes	159
	SAEOC00	OC	Binary	0 to 127	0	7 bits	216
	SAEpa01	Power, Apparent	1 VA/bit	-2,000,000,000 to +2,211,081,215 VA	-2,000,000,000 VA	4 bytes	148
	SAEpc01	Percent, position/level	0.0025 %/bit	0 to 160.6375 %	0	2 bytes	30
	SAEpc02	Percent, position/level	0.1 %/bit	0 to 102 %	0	10 bits	205
	SAEpc03	Percent, position/level	0.4 %/bit	0 to 100 %	0	1 byte	44
	SAEpc04	Percent, position/level	0.8 %/bit	-100 to 100 %	-100 %	1 byte	128
	SAEpc05	Percent, position/level	1 %/bit	-125 to 125 %	-125 %	1 byte	45
	SAEpc06	Percent, position/level	1 %/bit	0 to 250 %	0	1 byte	46

(R)

SLOT Name	SLOT Type	Scaling	Range	Offset	Length	SLOT Identifier
SAEpc07	Percent, position/level	0.1 %/bit	-100 to 100 %	-100	2 bytes	251
SAEpc08	Percent, position/level	0.0078125 %/bit	-251 to 250.99 %	-251	2 bytes	256
SAEpc09	Percent, position/level	0.004%/bit	-125 to 132.02%	-125	2 bytes	264
SAEpc10	Percent, position/level	0.125%/bit	0 to 0.875%	0	4 bits	268
SAEpc15	Percent, concentration	0.25 %/bit	0 to 62.5 %	0	1 byte	254
SAEpc16	Percent, concentration	0.000514 %/bit	-12% to 21%	-12 %	2 bytes	237
SAEpc17	Percent, gain	0.1 %/bit	-100 to 100 %	-100	2 bytes	295
SAEpc18	Percent	0.5%/bit	0 to 125%	0	1 byte	299
SAEpd01	Proprietary Data	Manufacturer Determined	Manufacturer Determined	Manufacturer Determined	64 to 14,280 bits	154
SAEpf01	Power Factor	1/16384 per bit	-1.00000 to +2.921814	-1	2 bytes	151
SAEpg00	PGN	Binary	0 to 16,777,215	0	3 bytes	116
SAEpp01	Parts Per Million	0.05 ppm/bit	-200 to 3012.75 ppm	-200 ppm	2 bytes	236
SAEpp02	Parts Per Million	1 ppm/bit	-125 to 125 ppm	-125 ppm	1 byte	296
SAEpr01	Pressure	1/128 kPa/bit	-250 kPa TO 251.99 kPa	-250 kPa	2 bytes	52
SAEpr02	Pressure	0.05 kPa/bit	0 to 12.5 kPa	0	1 byte	48
SAEpr03	Pressure	0.1 kPa/bit	0 to 6,425.5 kPa	0	2 bytes	85
SAEpr04	Pressure	0.125 kPa/bit	0 to +8031.875 kPa (0 to 1164.62 psi)	0	2 bytes	138
SAEpr05	Pressure	0.5 kPa/bit	0 to 125 kPa	0	1 byte	54
SAEpr06	Pressure	0.5 kPa/bit	0 to 32,127.5 kPa	0	2 bytes	50
SAEpr07	Pressure	2 kPa/bit	0 to 500 kPa	0	1 byte	53
SAEpr08	Pressure	2 kPa/bit	0 to 128,510 kPa	0	2 bytes	106
SAEpr09	Pressure	1/256 MPa/bit	0 to 251 MPa	0	2 bytes	51
SAEpr10	Pressure	4 kPa/bit	0 to 1000 kPa	0	1 byte	47
SAEpr11	Pressure	5 kPa/bit	0 to 1,250 kPa	0	1 byte	1
SAEpr12	Pressure	5 kPa/bit	0 to 321,275 kPa	0	2 bytes	130
SAEpr13	Pressure	8 kPa/bit	0 to 2,000 kPa	0	1 byte	2
SAEpr14	Pressure	16 kPa/bit	0 to 4000 kPa	0	1 byte	49
SAEpr15	Pressure	100 kPa/bit	0 to 25 MPa	0	1 byte	161
SAEpr16	Pressure	50 kPa/bit	0 to 12,500 kPa	0	1 byte	229
SAEpr17	Pressure	1.64 kPa/bit	-7 to 403 kPa	-7 kPa	1 byte	246
SAEprc01	Pressure Rate Change	0.1 Pa/s per bit	0 Pa/s to 6425.5 Pa/s	0	2 bytes	162
SAEpt01	Power, Reactive	1 VAr/bit	-2,000,000,000 to +2,211,081,215 VAr	-2,000,000,000 VAr	4 bytes	149
SAEpw01	Power, Real	1 W/bit	-2,000,000,000 to +2,211,081,215 W	-2,000,000,000 W	4 bytes	147
SAEpw02	Power, Real	2 W/bit	0 to 128,510 W	0	2 bytes	107
SAEpw03	Power, Real	0.5 kW/bit	0 to 32,127.5 kW	0	2 bytes	55
SAEr01	Ratio	0.001/bit	0 to 64.255	0	2 bytes	32
SAEr02	Ratio	0.1/bit	0 to 25.0	0	1 byte	31
SAEr03	Ratio	1/bit	0 to 250	0	1 byte	56
SAEra01	Range	1 range/bit	-32 to 29 ranges	-32 ranges	6 bits	263
SAErc01	Road Curvature	1/128 1/km per bit	-250 to 251.992 1/km	-250 1/km	2 bytes	96
SAErc02	Road Curvature	1/128 deg per bit	-90 to 90 deg	-90 deg	2 bytes	261
SAEre01	Record	1 record/bit	0 to 250 records	0	1 byte	33
SAErs01	Resistance	0.1 ohm/bit	0 to 6425.5 ohm	0	2 bytes	290
SAErv01	Revolutions	1000 r/bit	0 to 4,211,081,215,000 r	0	4 bytes	34
SAEsa01	Source Address	1 source address/bit	0 to 255	0	1 byte	35
SAEse01	Selection	1 selection/bit	0 to 255	0	1 byte	259
SAEsg01	Specific Gravity	0.0001/bit	0 to 6.4255	0	2 bytes	82
SAEsg02	Signal gain	0.5%/bar per bit	0 to 125%/bar	0	1 byte	298
SAEsh01	Specific Humidity	0.01 g/kg per bit	0 to 642.55 g/kg	0	2 bytes	285
SAESP00	SPN	Binary	0 to 524,287	0	19 bits	214
SAEsr01	Specific Resistance	0.1 Mohm*m/bit	0 to 25 Mohm*m	0	1 byte	83
SAEst01	Step	1 step/bit	0 to 250 steps	0	1 byte	84
SAEtc01	Trouble code	1 trouble code/bit	0 to 250	0	1 byte	274
SAEtd01	Transfer Data	Request Dependent	9 to 1777 bytes of data	Request Dependent	72 to 14,216 bits	155
SAEtd02	Transport Data	Request Dependent	9 to 1784 bytes of data	Request Dependent	72 to 14,272 bits	158
SAEtd03	Test data	Not defined	Not defined	Not defined	2 bytes	277
SAEtm01	Time	0.01 ms/bit	0 to 642.55 ms	0	2 bytes	57

SLOT Name	SLOT Type	Scaling	Range	Offset	Length	SLOT Identifier
SAEtm02	Time	1 ms/bit	0 to 64.255 s	0	2 bytes	132
SAEtm03	Time	0.1 s/bit	0 to 25 s	0	1 byte	59
SAEtm04	Time	0.25 s/bit	0 to 62.5 s	0	1 byte	63
SAEtm05	Time	1 s/bit	0 to 64,255 s	0	2 bytes	64
SAEtm06	Time	1 s/bit	0 to 4,211,081,215 s	0	4 bytes	6
SAEtm07	Time	1 min/bit	-125 to 125 mins	-125 min	1 byte	99
SAEtm08	Time	1 min/bit	0 to 250 mins	0	1 byte	61
SAEtm09	Time	0.05 hr/bit	0 to 210,554,060.75 hr	0	4 bytes	58
SAEtm10	Time	1 hr/bit	-125 to 125 hr	-125 hr	1 byte	4
SAEtm11	Time	1 hr/bit	0 to 250 hr	0	1 byte	3
SAEtm12	Time	1 hr/bit	-32,127 to 32,128 hr	-32,127 hr	2 bytes	5
SAEtm13	Time	51.2 us/bit	0 to 3.289856 s	0	2 bytes	206
SAEtm14	Time	0.1 hr/bit	0 to 6,425.5 hours	0	2 bytes	224
SAEtm15	Time	1 min/bit	0 to 64,255 mins	0	2 bytes	238
SAEtm16	Time	0.5 ms/bit	0 to 125 ms	0	1 byte	241
SAEtm17	Time	1 ms/bit	0 to 250 ms	0	1 byte	247
SAEtp01	Temperature	1 deg C/bit	-40 to 210 deg C	-40 deg C	1 byte	67
SAEtp02	Temperature	0.03125 deg C/bit	-273 to 1734.96875 deg C	-273 deg C	2 bytes	68
SAEtq01	Torque	1 Nm/bit	-32,000 to 32,255 Nm	-32,000 Nm	2 bytes	69
SAEtq02	Torque	1 Nm/bit	0 to 64,255 Nm	0	2 bytes	70
SAEtq03	Torque	2 Nm/bit	0 to 128,510 Nm	0	2 bytes	98
SAEtq04	Torque	30 Nm/bit	0 to 7500 Nm	0	1 byte	137
SAEva01	Velocity, angular	1/8192 rad/s per bit	-3.92 to +3.92 rad/s	-3.92 rad/s	2 bytes	114
SAEva02	Velocity, angular	0.002 deg/sec per bit	-64 to 64.51 deg/sec	-64 deg/sec	2 bytes	243
SAEva03	Velocity, angular	1/128 deg/sec per bit	-250 to 250.992 deg/sec	-250 deg/sec	2 bytes	288
SAEvd01	VariantData	Variant Determined	Variant Determined	Variant Determined	4 bytes	134
SAEvl01	Velocity, linear	0.001 m/s per bit	0 to 64.255 m/s	0	2 bytes	125
SAEvl02	Velocity, linear	1/256 km/h per bit	0 to 250.996 km/h	0	2 bytes	71
SAEvl03	Velocity, linear	1/128 km/h per bit	-250 to 251.992 km/h	-250 km/h	2 bytes	72
SAEvl04	Velocity, linear	1/16 km/h per bit	-7.8125 to 7.8125 km/h	-7.8125 km/h	1 byte	74
SAEvl05	Velocity, linear	1 km/h per bit	0 to 250 km/h	0	1 byte	73
SAEvm01	Velocity, magnitude	2 m/h per bit	0 to 128510 m/h	0	2 bytes	219
SAEvm1	Volume	0.5 L/bit	0 to 2,105,540,607.5 L	0	4 bytes	75
SAEvm2	Volume	0.5 L/bit	0 to 32127.5 liters	0	2 bytes	222
SAEvm3	Volume	0.5 L/bit	-62.5 to 62.5 L	-62.5 L	1 bytes	225
SAEvr01	Velocity, rotational	0.125 rpm/bit	0 to 8,031.875 rpm	0	2 bytes	76
SAEvr02	Velocity, rotational	0.5 rpm/bit	0 to 32,127.5 rpm	0	2 bytes	78
SAEvr03	Velocity, rotational	4 rpm/bit	0 to 257,020 rpm	0	2 bytes	77
SAEvr04	Velocity, rotational	10 rpm/bit	0 to 2,500 rpm	0	1 byte	79
SAEvr05	Velocity, rotational	32 rpm/bit	0 to 8,000 rpm	0	1 byte	97
SAEvr06	Velocity, rotational	1 rpm/bit	0 to 64255 rpm	0	2 bytes	223

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**APPENDIX B  
SPNs****SPN 16                    *Engine Fuel Filter (Suction Side) Differential Pressure (see also SPN 1382)***

Differential pressure measured across the fuel filter located between the fuel tank and the supply pump. See Figures SPN16\_A & SPN16\_B.

|                         |                         |                                       |
|-------------------------|-------------------------|---------------------------------------|
| Data Length:            | 1 byte                  |                                       |
| Resolution:             | 2 kPa/bit, 0 offset     |                                       |
| Data Range:             | 0 to 500 kPa            | Operational Range: same as data range |
| Type:                   | Measured                |                                       |
| Supporting Information: | See Appendix D - SPN 16 |                                       |
| PGN reference:          |                         |                                       |

**SPN 21                    *Engine ECU Temperature (use SPN 1136)***

Temperature of the engine electronic control unit.

(21, 1207 are not to be used - obsolete)

|                         |                                      |                                       |
|-------------------------|--------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                              |                                       |
| Resolution:             | 0.03125 deg C/bit, -273 deg C offset |                                       |
| Data Range:             | -273 to 1734.96875 deg C             | Operational Range: same as data range |
| Type:                   | Measured                             |                                       |
| Supporting Information: |                                      |                                       |
| PGN reference:          |                                      |                                       |

**SPN 22                    *Engine Extended Crankcase Blow-by Pressure***

Differential crankcase blow-by pressure as measured through a tube with a venturi.

(1264 not to be used – obsolete)

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 0.05 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 12.5 kPa          | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65263                  |                                       |

**(R) SPN 27      Engine Exhaust Gas Recirculation 1 Valve Position**

The position of the exhaust gas recirculation valve expressed as a percentage of full travel. Zero percent means the valve is closed and no exhaust gas is flowing into the intake air stream. One hundred percent means the valve is fully opened.

|                         |                         |                                       |
|-------------------------|-------------------------|---------------------------------------|
| Data Length:            | 2 bytes                 |                                       |
| Resolution:             | 0.0025 %/bit, 0 offset  |                                       |
| Data Range:             | 0 to 160.6375 %         | Operational Range: same as data range |
| Type:                   | Measured                |                                       |
| Supporting Information: | See Appendix D - SPN 27 |                                       |
| PGN reference:          | 64916                   |                                       |

**SPN 29      Accelerator Pedal Position 2**

The ratio of actual position of the second analog engine speed/torque request input device (such as an accelerator pedal or throttle lever) to the maximum position of the input device. This parameter is intended for secondary accelerator control in an application. If an application has only one accelerator control, use SPN 91.

In marine applications, this will typically be the operator's second throttle lever.

If a low idle validation switch is used in conjunction with accelerator pedal position 2, use Accelerator Pedal Low Idle Switch 2, SPN 2970.

NOTE—See SPNs 91 and 974 for additional accelerator position parameters. SPN 28 is an additional diagnostic SPN for accelerator position.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 61443               |                                       |

**SPN 38      Fuel Level 2**

Ratio of volume of fuel to the total volume of fuel in the second or right-side storage container. When Fuel Level 2 is not used, Fuel Level 1 (SPN 96) represents the total fuel in all fuel storage containers.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65276               |                                       |

**SPN 39                      Tire Pressure Check Interval**

The interval at which the system will check the tire pressures (e.g., 5, 10, 15 min.).

NOTE - A value of 0 indicates continuous (real time) pressure readings.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 1 min/bit, 0 offset |                                       |
| Data Range:             | 0 to 250 mins       | Operational Range: same as data range |
| Type:                   | Status              |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65144               |                                       |

**SPN 46                      Pneumatic Supply Pressure**

The pneumatic pressure in the main reservoir, sometimes referred to as the wet tank.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 8 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 2,000 kPa      | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65198               |                                       |

**(R) SPN 51                      Engine Throttle Valve 1 Position**

The position of the valve used to regulate the supply of a fluid, usually air or fuel/air mixture, to an engine. 0% represents no supply and 100% is full supply.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65266               |                                       |

**SPN 52                      Engine Intercooler Temperature**

Temperature of liquid found in the intercooler located after the turbocharger.

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 deg C/bit, -40 deg C offset |                                       |
| Data Range:             | -40 to 210 deg C              | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          | 65262                         |                                       |

**SPN 53                      Transmission Synchronizer Clutch Value**

The current modulated value for the air supply to the synchronizer clutch.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65221               |                                       |

**SPN 54                      Transmission Synchronizer Brake Value**

The current modulated value for the air supply to the synchronizer brake.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65221               |                                       |

**SPN 59                      Transmission Shift Finger Gear Position**

The current position of the shift finger in the gear direction.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65223               |                                       |

**SPN 60                      Transmission Shift Finger Rail Position**

The current position of the shift finger in the rail direction.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65223               |                                       |



**SPN 69                      Two Speed Axle Switch**

Switch signal which indicates the current axle range.

00 - Low speed range  
01 - High speed range  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65265

Operational Range: same as data range

**SPN 70                      Parking Brake Switch**

Switch signal which indicates when the parking brake is set. In general the switch actuated by the operator's park brake control, whether a pedal, lever or other control mechanism (see also SPN 619 and 5275).

00 - Parking brake not set  
01 - Parking brake set  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information: See Appendix D - SPN 5275  
PGN reference:        65265

Operational Range: same as data range

**SPN 72                      Engine Blower Bypass Valve Position**

Relative position of the blower bypass valve.

Data Length:            1 byte  
Resolution:            0.4 %/bit, 0 offset  
Data Range:            0 to 100 %  
Type:                    Measured  
Supporting Information:  
PGN reference:        65277

Operational Range: same as data range

**SPN 73                    Auxiliary Pump Pressure**

Gage pressure of auxiliary water pump driven as a PTO device.

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 1 byte               |                                       |
| Resolution:             | 16 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 4000 kPa        | Operational Range: same as data range |
| Type:                   | Measured             |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 65278                |                                       |

**SPN 74                    Maximum Vehicle Speed Limit**

Maximum vehicle velocity allowed.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 1 byte                   |                                       |
| Resolution:             | 1 km/h per bit, 0 offset |                                       |
| Data Range:             | 0 to 250 km/h            | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65261                    |                                       |

**SPN 75                    Steering Axle Temperature**

Temperature of lubricant in steering axle.

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 deg C/bit, -40 deg C offset |                                       |
| Data Range:             | -40 to 210 deg C              | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          | 65273                         |                                       |

**SPN 79                    Road Surface Temperature**

Indicated temperature of road surface over which vehicle is operating.

|                         |                                      |                                       |
|-------------------------|--------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                              |                                       |
| Resolution:             | 0.03125 deg C/bit, -273 deg C offset |                                       |
| Data Range:             | -273 to 1734.96875 deg C             | Operational Range: same as data range |
| Type:                   | Measured                             |                                       |
| Supporting Information: |                                      |                                       |
| PGN reference:          | 65269                                |                                       |

**SPN 80                      Washer Fluid Level**

Ratio of volume of liquid to total container volume of fluid reservoir in windshield wash system.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65276               |                                       |

**(R) SPN 81                      Engine Diesel Particulate Filter Intake Pressure**

Exhaust back pressure as a result of particle accumulation on filter media placed in the exhaust stream. See SPN 3609 for better resolution.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 1 byte                |                                       |
| Resolution:             | 0.5 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 125 kPa          | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65270                 |                                       |

**SPN 82                      Engine Air Start Pressure**

Gage pressure of air in an engine starting system that utilizes compressed air to provide the force required to rotate the crankshaft.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 4 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 1000 kPa       | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65246               |                                       |

**SPN 84                      Wheel-Based Vehicle Speed**

Speed of the vehicle as calculated from wheel or tailshaft speed.

|                         |                              |                                       |
|-------------------------|------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                      |                                       |
| Resolution:             | 1/256 km/h per bit, 0 offset |                                       |
| Data Range:             | 0 to 250.996 km/h            | Operational Range: same as data range |
| Type:                   | Measured                     |                                       |
| Supporting Information: |                              |                                       |
| PGN reference:          | 65265                        |                                       |

**SPN 86                      Cruise Control Set Speed**

Value of set (chosen) velocity of velocity control system.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 1 byte                   |                                       |
| Resolution:             | 1 km/h per bit, 0 offset |                                       |
| Data Range:             | 0 to 250 km/h            | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65265                    |                                       |

**SPN 87                      Cruise Control High Set Limit Speed**

Maximum vehicle velocity at which cruise can be set.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 1 byte                   |                                       |
| Resolution:             | 1 km/h per bit, 0 offset |                                       |
| Data Range:             | 0 to 250 km/h            | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65261                    |                                       |

**SPN 88                      Cruise Control Low Set Limit Speed**

Minimum vehicle velocity at which cruise can be set or minimum vehicle velocity for cruise operation before it will exit cruise control operation.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 1 byte                   |                                       |
| Resolution:             | 1 km/h per bit, 0 offset |                                       |
| Data Range:             | 0 to 250 km/h            | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65261                    |                                       |

**SPN 90                      Power Takeoff Oil Temperature**

Temperature of lubricant in device used to transmit engine power to auxiliary equipment.

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 deg C/bit, -40 deg C offset |                                       |
| Data Range:             | -40 to 210 deg C              | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          | 65264                         |                                       |

**SPN 91                    Accelerator Pedal Position 1**

The ratio of actual position of the analog engine speed/torque request input device (such as an accelerator pedal or throttle lever) to the maximum position of the input device. This parameter is intended for the primary accelerator control in an application. If an application has only one accelerator control, use SPN 91.

For on-highway vehicles, this will typically be the operator's accelerator pedal. Although it is used as an input to determine powertrain demand, it also provides anticipatory information to transmission and ASR algorithms about driver actions.

In marine applications, this will typically be the operator's throttle lever.

If a low idle validation switch is used in conjunction with accelerator pedal position 1, use Accelerator Pedal Low Idle Switch 1, SPN 558.

NOTE—See SPNs 29 and 974 for additional accelerator position parameters. SPN 28 is an additional diagnostic SPN for accelerator position.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 61443               |                                       |

**SPN 92                    Engine Percent Load At Current Speed**

The ratio of actual engine percent torque (indicated) to maximum indicated torque available at the current engine speed, clipped to zero torque during engine braking.

|                         |                   |                              |
|-------------------------|-------------------|------------------------------|
| Data Length:            | 1 byte            |                              |
| Resolution:             | 1 %/bit, 0 offset |                              |
| Data Range:             | 0 to 250 %        | Operational Range: 0 to 125% |
| Type:                   | Status            |                              |
| Supporting Information: |                   |                              |
| PGN reference:          | 61443             |                              |

**SPN 94                    Engine Fuel Delivery Pressure**

Gage pressure of fuel in system as delivered from supply pump to the injection pump. See Figures SPN16\_A & SPN16\_B.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 4 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 1000 kPa       | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65263               |                                       |

**SPN 95                      Engine Fuel Filter Differential Pressure**

Change in fuel delivery pressure, measured across the filter, due to accumulation of solid or semisolid matter on the filter element. See Figures SPN16\_A & SPN16\_B.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 2 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 500 kPa        | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65276               |                                       |

**SPN 96                      Fuel Level 1**

Ratio of volume of fuel to the total volume of fuel storage container.

When Fuel Level 2 (SPN 38) is not used, Fuel Level 1 represents the total fuel in all fuel storage containers. When Fuel Level 2 is used, Fuel Level 1 represents the fuel level in the primary or left-side fuel storage container.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65276               |                                       |

**SPN 97                      Water In Fuel Indicator**

Signal which indicates the presence of water in the fuel.

00 - No  
01 - Yes  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65279                    |                                       |

**SPN 98                      Engine Oil Level**

Ratio of current volume of engine sump oil to maximum required volume.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65263               |                                       |

**SPN 99                    Engine Oil Filter Differential Pressure**

Change in engine oil pressure, measured across the filter, due to the filter and any accumulation of solid or semisolid material on or in the filter.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 1 byte                |                                       |
| Resolution:             | 0.5 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 125 kPa          | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65276                 |                                       |

**SPN 100                   Engine Oil Pressure**

Gage pressure of oil in engine lubrication system as provided by oil pump.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 4 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 1000 kPa       | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65263               |                                       |

**SPN 101                   Engine Crankcase Pressure**

Gage pressure inside engine crankcase.

|                         |                                |                                       |
|-------------------------|--------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                        |                                       |
| Resolution:             | 1/128 kPa/bit, -250 kPa offset |                                       |
| Data Range:             | -250 kPa TO 251.99 kPa         | Operational Range: same as data range |
| Type:                   | Measured                       |                                       |
| Supporting Information: |                                |                                       |
| PGN reference:          | 65263                          |                                       |

**SPN 102                   Engine Intake Manifold #1 Pressure**

The gage pressure measurement of the air intake manifold. If there are multiple air pressure sensors in the intake stream, this is the last one in flow direction before entering the combustion chamber. This should be the pressure used to drive gauges and displays. See also SPNs 1127-1130 and SPN 3562 for alternate range and resolution. If there is only one pressure measurement of the air intake manifold to report and this range and resolution is adequate, this parameter should be used.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 2 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 500 kPa        | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65270               |                                       |

**SPN 103                    Engine Turbocharger 1 Speed**

Rotational velocity of rotor in the turbocharger.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 2 bytes             |                                       |
| Resolution:             | 4 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 257,020 rpm    | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65245               |                                       |

**SPN 104                    Engine Turbocharger Lube Oil Pressure 1**

Gage pressure of oil in turbocharger lubrication system.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 4 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 1000 kPa       | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65245               |                                       |

**SPN 105                    Engine Intake Manifold 1 Temperature**

Temperature of pre-combustion air found in intake manifold of engine air supply system.

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 deg C/bit, -40 deg C offset |                                       |
| Data Range:             | -40 to 210 deg C              | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          | 65270                         |                                       |

**(R) SPN 106                Engine Air Intake Pressure**

Absolute air pressure at input port to intake manifold or air box.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 2 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 500 kPa        | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65270               |                                       |



**SPN 107                      Engine Air Filter 1 Differential Pressure**

Change in engine air system pressure, measured across the filter, due to the filter and any accumulation of solid foreign matter on or in the filter.

This is the measurement of the first filter in a multiple air filter system. In a single air filter application, this is the only SPN used. Filter numbering follows the guidelines noted in section, Naming Convention For Engine Parameters.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 0.05 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 12.5 kPa          | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65270                  |                                       |

**SPN 108                      Barometric Pressure**

Absolute air pressure of the atmosphere. See Figures SPN16\_A & SPN16\_B.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 1 byte                |                                       |
| Resolution:             | 0.5 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 125 kPa          | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65269                 |                                       |

**SPN 109                      Engine Coolant Pressure**

Gage pressure of liquid found in engine cooling system.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 2 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 500 kPa        | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65263               |                                       |

**SPN 110                      Engine Coolant Temperature**

Temperature of liquid found in engine cooling system.

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 deg C/bit, -40 deg C offset |                                       |
| Data Range:             | -40 to 210 deg C              | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          | 65262                         |                                       |

**SPN 111      Engine Coolant Level**

Ratio of volume of liquid found in engine cooling system to total cooling system volume. Typical monitoring location is in the coolant expansion tank.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65263               |                                       |

**SPN 112      Engine Coolant Filter Differential Pressure**

Change in coolant pressure, measured across the filter, due to the filter and any accumulation of solid or semisolid matter on or in the filter.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 1 byte                |                                       |
| Resolution:             | 0.5 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 125 kPa          | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65270                 |                                       |

**SPN 114      Net Battery Current**

Net flow of electrical current into/out of the battery or batteries.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 1 A/bit, -125 A offset |                                       |
| Data Range:             | -125 to 125 A          | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65271                  |                                       |

**SPN 115      Alternator Current**

Measure of electrical current flow from the alternator. Alternator Current (High Range/Resolution) parameter SPN 1795 has a higher range and resolution of the same parameter.

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 1 byte            |                                       |
| Resolution:             | 1 A/bit, 0 offset |                                       |
| Data Range:             | 0 to 250 A        | Operational Range: same as data range |
| Type:                   | Measured          |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 65271             |                                       |

**SPN 116                    Brake Application Pressure**

Gage pressure of compressed air or fluid in vehicle braking system measured at the brake chamber when brake shoe (or pad) is placed against brake drum (or disc).

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 4 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 1000 kPa       | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65274               |                                       |

**SPN 117                    Brake Primary Pressure**

Gage pressure of air in the primary, or supply side, of the air brake system.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 4 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 1000 kPa       | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65274               |                                       |

**SPN 118                    Brake Secondary Pressure**

Gage pressure of air in the secondary, or service side, of the air brake system.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 4 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 1000 kPa       | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65274               |                                       |

**SPN 119                    Hydraulic Retarder Pressure**

Gage pressure of oil in hydraulic retarder system.

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 1 byte               |                                       |
| Resolution:             | 16 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 4000 kPa        | Operational Range: same as data range |
| Type:                   | Measured             |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 65275                |                                       |

**SPN 120                    Hydraulic Retarder Oil Temperature**

Temperature of oil found in a hydraulic retarder.

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 deg C/bit, -40 deg C offset |                                       |
| Data Range:             | -40 to 210 deg C              | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          | 65275                         |                                       |

**SPN 123                    Clutch Pressure**

Gage pressure of oil within a wet clutch.

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 1 byte               |                                       |
| Resolution:             | 16 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 4000 kPa        | Operational Range: same as data range |
| Type:                   | Measured             |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 65272                |                                       |

**SPN 124                    Transmission Oil Level**

Ratio of volume of transmission sump oil to recommended volume.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65272               |                                       |

**SPN 126                    Transmission Filter Differential Pressure**

Change in transmission fluid pressure, measured after the filter, due to accumulation of solid or semisolid material on or in the filter.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 2 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 500 kPa        | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65272               |                                       |

**SPN 127                      Transmission Oil Pressure**

Gage pressure of lubrication fluid in transmission, measured after pump.

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 1 byte               |                                       |
| Resolution:             | 16 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 4000 kPa        | Operational Range: same as data range |
| Type:                   | Measured             |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 65272                |                                       |

**(R) SPN 129                      Engine Injector Metering Rail 2 Pressure (duplicate, use SPN 1349)**

The gage pressure of fuel in the metering rail #2 as delivered from the supply pump to the injector metering intake. See Figure SPN16\_A for fuel system related parameters. Although the figure does not show rail #2 it does show the relationship of rail pressure to other signals.

(Obsolete - use SPN 1349)

|                         |                         |                                       |
|-------------------------|-------------------------|---------------------------------------|
| Data Length:            | 2 bytes                 |                                       |
| Resolution:             | 1/256 MPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 251 MPa            | Operational Range: same as data range |
| Type:                   | Measured                |                                       |
| Supporting Information: |                         |                                       |
| PGN reference:          |                         |                                       |

**(R) SPN 132                      Engine Intake Air Mass Flow Rate**

Mass flow rate of fresh air entering the engine air intake, before any EGR mixer, if used. Flow rate of fresh air conducted to the engine cylinders to support combustion.

|                         |                             |                                       |
|-------------------------|-----------------------------|---------------------------------------|
| Data Length:            | 2 bytes                     |                                       |
| Resolution:             | 0.05 kg/h per bit, 0 offset |                                       |
| Data Range:             | 0 to 3212.75 kg/h           | Operational Range: same as data range |
| Type:                   | Measured                    |                                       |
| Supporting Information: |                             |                                       |
| PGN reference:          | 61450                       |                                       |

**SPN 136                      Auxiliary Vacuum Pressure Reading**

Identifies the current vacuum pressure (relative to atmosphere) that is configured uniquely per application. Not to be used in place of defined parameters.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.5 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 32,127.5 kPa     | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65143                 |                                       |

**SPN 137      Auxiliary Gage Pressure Reading 1**

Identifies the current gage pressure (relative to atmosphere) that is configured uniquely per application. Not to be used in place of defined parameters.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.5 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 32,127.5 kPa     | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65143                 |                                       |

**SPN 138      Auxiliary Absolute Pressure Reading**

Identifies the current absolute pressure (relative to 0 pressure) that is configured uniquely per application. Not to be used in place of defined parameters.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.5 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 32,127.5 kPa     | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65143                 |                                       |

**SPN 141      Trailer, Tag Or Push Channel Tire Pressure Target**

The tire pressure control system's target gage pressure for the trailer, tag, or push group of tires.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.5 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 32,127.5 kPa     | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65145                 |                                       |

**SPN 142      Drive Channel Tire Pressure Target**

The tire pressure control system's target gage pressure for the drive group of tires.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.5 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 32,127.5 kPa     | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65145                 |                                       |

**SPN 143           Steer Channel Tire Pressure Target**

The tire pressure control system's target gage pressure for the steer group of tires.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.5 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 32,127.5 kPa     | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65145                 |                                       |

**SPN 144           Trailer, Tag Or Push Channel Tire Pressure**

The latest gage pressure reading of the trailer, tag, or push group of tires, as opposed to the pressure in each tire.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.5 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 32,127.5 kPa     | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65146                 |                                       |

**SPN 145           Drive Channel Tire Pressure**

The latest gage pressure reading of the drive group of tires, as opposed to the pressure in each tire.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.5 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 32,127.5 kPa     | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65146                 |                                       |

**SPN 146           Steer Channel Tire Pressure**

The latest gage pressure reading of the steer group of tires, as opposed to the pressure in each tire.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.5 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 32,127.5 kPa     | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65146                 |                                       |

**(R) SPN 156      Engine Injector Timing Rail 1 Pressure**

The gage pressure of fuel in the timing rail delivered from the supply pump to the injector timing intake.

|                         |                         |                                       |
|-------------------------|-------------------------|---------------------------------------|
| Data Length:            | 2 bytes                 |                                       |
| Resolution:             | 1/256 MPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 251 MPa            | Operational Range: same as data range |
| Type:                   | Measured                |                                       |
| Supporting Information: | See Appendix D - SPN 16 |                                       |
| PGN reference:          | 65243                   |                                       |

**(R) SPN 157      Engine Injector Metering Rail 1 Pressure**

The gage pressure of fuel in the primary, or first, metering rail as delivered from the supply pump to the injector metering intake. See Figure SPN16\_A.

|                         |                         |                                       |
|-------------------------|-------------------------|---------------------------------------|
| Data Length:            | 2 bytes                 |                                       |
| Resolution:             | 1/256 MPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 251 MPa            | Operational Range: same as data range |
| Type:                   | Measured                |                                       |
| Supporting Information: |                         |                                       |
| PGN reference:          | 65243                   |                                       |

**SPN 158      Keyswitch Battery Potential**

Battery potential measured at the input of the electronic control unit supplied through a keyswitch or similar switching device.

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 2 bytes              |                                       |
| Resolution:             | 0.05 V/bit, 0 offset |                                       |
| Data Range:             | 0 to 3212.75 V       | Operational Range: same as data range |
| Type:                   | Measured             |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 65271                |                                       |

**SPN 159      Engine Gas Supply Pressure**

Gage pressure of gas supply to fuel metering device.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.5 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 32,127.5 kPa     | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65277                 |                                       |



**SPN 160            Main Shaft Speed**

Rotational velocity of the first intermediate shaft of the transmission.

|                         |                         |                                       |
|-------------------------|-------------------------|---------------------------------------|
| Data Length:            | 2 bytes                 |                                       |
| Resolution:             | 0.125 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 8,031.875 rpm      | Operational Range: same as data range |
| Type:                   | Measured                |                                       |
| Supporting Information: |                         |                                       |
| PGN reference:          |                         |                                       |

**SPN 161            Transmission Input Shaft Speed**

Rotational velocity of the primary shaft transferring power into the transmission. When a torque converter is present, it is the output of the torque converter.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 2 bytes                   |                                       |
| Resolution:             | 0.125 rpm/bit, 0 offset   |                                       |
| Data Range:             | 0 to 8,031.875 rpm        | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: | See Appendix D - SPN 5052 |                                       |
| PGN reference:          | 61442                     |                                       |

**SPN 162            Transmission Requested Range**

Range selected by the operator. Characters may include P, Rx, Rx-1...R2, R1, R, Nx, Nx-1...N2, N1, N, D, D1, D2..., Dx, L, L1, L2..., Lx-1, 1, 2, 3,... If only one displayed character is required, the second character shall be used and the first character shall be a space (ASCII 32) or a control character (ASCII 0 to 31). If the first character is a control character, refer to the manufacturer's application document for definition.

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 2 bytes           |                                       |
| Resolution:             | ASCII, 0 offset   |                                       |
| Data Range:             | 0 to 255 per byte | Operational Range: same as data range |
| Type:                   | Status            |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 61445             |                                       |

**SPN 163            Transmission Current Range**

Range currently being commanded by the transmission control system. Characters may include P, Rx, Rx-1...R2, R1, R, Nx, Nx-1...N2, N1, N, D, D1, D2..., Dx, L, L1, L2..., Lx-1, 1, 2, 3,... If only one displayed character is required, the second character shall be used and the first character shall be a space (ASCII 32) or a control character (ASCII 0 to 31). If the first character is a control character, refer to the manufacturer's application document for definition.

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 2 bytes           |                                       |
| Resolution:             | ASCII, 0 offset   |                                       |
| Data Range:             | 0 to 255 per byte | Operational Range: same as data range |
| Type:                   | Status            |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 61445             |                                       |

**SPN 164                    Engine Injection Control Pressure**

The gage pressure of the engine oil in the hydraulic accumulator that powers an intensifier used for fuel injection.

|                         |                         |                                       |
|-------------------------|-------------------------|---------------------------------------|
| Data Length:            | 2 bytes                 |                                       |
| Resolution:             | 1/256 MPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 251 MPa            | Operational Range: same as data range |
| Type:                   | Measured                |                                       |
| Supporting Information: |                         |                                       |
| PGN reference:          | 65243                   |                                       |

**SPN 165                    Compass Bearing**

Present compass bearing of vehicle.

|                         |                         |                                       |
|-------------------------|-------------------------|---------------------------------------|
| Data Length:            | 2 bytes                 |                                       |
| Resolution:             | 1/128 deg/bit, 0 offset |                                       |
| Data Range:             | 0 to 501.99 deg         | Operational Range: same as data range |
| Type:                   | Measured                |                                       |
| Supporting Information: |                         |                                       |
| PGN reference:          | 65256                   |                                       |

**SPN 166                    Engine Rated Power**

Net brake power that the engine will deliver continuously, specified for a given application at a rated speed.

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 2 bytes              |                                       |
| Resolution:             | 0.5 kW/bit, 0 offset |                                       |
| Data Range:             | 0 to 32,127.5 kW     | Operational Range: same as data range |
| Type:                   | Measured             |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 65214                |                                       |

**SPN 167                    Charging System Potential (Voltage)**

Electrical potential measured at the charging system output. The charging system may be any device charging the batteries. This includes alternators, generators, solid state charger and other charging devices.

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 2 bytes              |                                       |
| Resolution:             | 0.05 V/bit, 0 offset |                                       |
| Data Range:             | 0 to 3212.75 V       | Operational Range: same as data range |
| Type:                   | Measured             |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 65271                |                                       |

**SPN 168                      Battery Potential / Power Input 1**

This parameter measures the first source of battery potential as measured at the input of the ECM/actuator etc. coming from one or more batteries, irrespective of the distance between the component and the battery. This SPN is also used when ECM's are interconnected in a series configuration, where the source of power is coming directly or indirectly from the same battery/batteries.

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bytes                    |                                       |
| Resolution:             | 0.05 V/bit, 0 offset       |                                       |
| Data Range:             | 0 to 3212.75 V             | Operational Range: same as data range |
| Type:                   | Measured                   |                                       |
| Supporting Information: | See Appendix D - PGN 65104 |                                       |
| PGN reference:          | 65271                      |                                       |

**SPN 169                      Cargo Ambient Temperature**

Temperature of air inside vehicle container used to accommodate cargo.

|                         |                                      |                                       |
|-------------------------|--------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                              |                                       |
| Resolution:             | 0.03125 deg C/bit, -273 deg C offset |                                       |
| Data Range:             | -273 to 1734.96875 deg C             | Operational Range: same as data range |
| Type:                   | Measured                             |                                       |
| Supporting Information: |                                      |                                       |
| PGN reference:          | 65276                                |                                       |

**SPN 170                      Cab Interior Temperature**

Temperature of air inside the part of the vehicle that encloses the driver and vehicle operating controls.

Note: See also SPN 1691. SPN 1662 is an additional diagnostic SPN associated with cab temperature.

|                         |                                      |                                       |
|-------------------------|--------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                              |                                       |
| Resolution:             | 0.03125 deg C/bit, -273 deg C offset |                                       |
| Data Range:             | -273 to 1734.96875 deg C             | Operational Range: same as data range |
| Type:                   | Measured                             |                                       |
| Supporting Information: |                                      |                                       |
| PGN reference:          | 65269                                |                                       |

**SPN 171                      Ambient Air Temperature**

Temperature of air surrounding vehicle.

|                         |                                      |                                       |
|-------------------------|--------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                              |                                       |
| Resolution:             | 0.03125 deg C/bit, -273 deg C offset |                                       |
| Data Range:             | -273 to 1734.96875 deg C             | Operational Range: same as data range |
| Type:                   | Measured                             |                                       |
| Supporting Information: |                                      |                                       |
| PGN reference:          | 65269                                |                                       |

**SPN 172      Engine Air Intake Temperature**

Temperature of air entering vehicle air induction system.

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 deg C/bit, -40 deg C offset |                                       |
| Data Range:             | -40 to 210 deg C              | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          | 65269                         |                                       |

**SPN 173      Engine Exhaust Gas Temperature**

Temperature of combustion byproducts leaving the engine. See SPNs 2433 and 2434 for engines with more than one exhaust gas temperature measurement.

|                         |                                      |                                       |
|-------------------------|--------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                              |                                       |
| Resolution:             | 0.03125 deg C/bit, -273 deg C offset |                                       |
| Data Range:             | -273 to 1734.96875 deg C             | Operational Range: same as data range |
| Type:                   | Measured                             |                                       |
| Supporting Information: |                                      |                                       |
| PGN reference:          | 65270                                |                                       |

**SPN 174      Engine Fuel Temperature 1**

Temperature of fuel (or gas) passing through the first fuel control system. See SPN 3468 for the second control system

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 deg C/bit, -40 deg C offset |                                       |
| Data Range:             | -40 to 210 deg C              | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          | 65262                         |                                       |

**SPN 175      Engine Oil Temperature 1**

Temperature of the engine lubricant.

|                         |                                      |                                       |
|-------------------------|--------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                              |                                       |
| Resolution:             | 0.03125 deg C/bit, -273 deg C offset |                                       |
| Data Range:             | -273 to 1734.96875 deg C             | Operational Range: same as data range |
| Type:                   | Measured                             |                                       |
| Supporting Information: |                                      |                                       |
| PGN reference:          | 65262                                |                                       |

**SPN 176            Engine Turbocharger Oil Temperature**

Temperature of the turbocharger lubricant.

Data Length:            2 bytes  
Resolution:            0.03125 deg C/bit, -273 deg C offset  
Data Range:            -273 to 1734.96875 deg C            Operational Range: same as data range  
Type:            Measured  
Supporting Information:  
PGN reference:            65262

**SPN 177            Transmission Oil Temperature**

Temperature of the transmission lubricant.

Data Length:            2 bytes  
Resolution:            0.03125 deg C/bit, -273 deg C offset  
Data Range:            -273 to 1734.96875 deg C            Operational Range: same as data range  
Type:            Measured  
Supporting Information:  
PGN reference:            65272

**SPN 180            Trailer Weight**

Total mass of freight-carrying vehicle designed to be pulled by truck, including the weight of the contents.

Data Length:            2 bytes  
Resolution:            2 kg/bit, 0 offset  
Data Range:            0 to 128,510 kg            Operational Range: same as data range  
Type:            Measured  
Supporting Information:  
PGN reference:            65258

**SPN 181            Cargo Weight**

The mass of freight carried.

Data Length:            2 bytes  
Resolution:            2 kg/bit, 0 offset  
Data Range:            0 to 128,510 kg            Operational Range: same as data range  
Type:            Measured  
Supporting Information:  
PGN reference:            65258

**(R) SPN 182      Engine Trip Fuel**

Fuel consumed during all or part of a journey. See SPN 5053 for alternate resolution.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.5 L/bit, 0 offset    |                                       |
| Data Range:             | 0 to 2,105,540,607.5 L | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65257                  |                                       |

**SPN 183      Engine Fuel Rate**

Amount of fuel consumed by engine per unit of time.

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bytes                    |                                       |
| Resolution:             | 0.05 L/h per bit, 0 offset |                                       |
| Data Range:             | 0 to 3,212.75 L/h          | Operational Range: same as data range |
| Type:                   | Measured                   |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 65266                      |                                       |

**SPN 184      Engine Instantaneous Fuel Economy**

Current fuel economy at current vehicle velocity.

|                         |                              |                                       |
|-------------------------|------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                      |                                       |
| Resolution:             | 1/512 km/L per bit, 0 offset |                                       |
| Data Range:             | 0 to 125.5 km/L              | Operational Range: same as data range |
| Type:                   | Measured                     |                                       |
| Supporting Information: |                              |                                       |
| PGN reference:          | 65266                        |                                       |

**SPN 185      Engine Average Fuel Economy**

Average of instantaneous fuel economy for that segment of vehicle operation of interest.

|                         |                              |                                       |
|-------------------------|------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                      |                                       |
| Resolution:             | 1/512 km/L per bit, 0 offset |                                       |
| Data Range:             | 0 to 125.5 km/L              | Operational Range: same as data range |
| Type:                   | Measured                     |                                       |
| Supporting Information: |                              |                                       |
| PGN reference:          | 65266                        |                                       |

**SPN 186                      Power Takeoff Speed**

Rotational velocity of device used to transmit engine power to auxiliary equipment.

|                         |                         |                                       |
|-------------------------|-------------------------|---------------------------------------|
| Data Length:            | 2 bytes                 |                                       |
| Resolution:             | 0.125 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 8,031.875 rpm      | Operational Range: same as data range |
| Type:                   | Measured                |                                       |
| Supporting Information: |                         |                                       |
| PGN reference:          | 65264                   |                                       |

**SPN 187                      Power Takeoff Set Speed**

Rotational velocity selected by operator for device used to transmit engine power to auxiliary equipment.

|                         |                         |                                       |
|-------------------------|-------------------------|---------------------------------------|
| Data Length:            | 2 bytes                 |                                       |
| Resolution:             | 0.125 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 8,031.875 rpm      | Operational Range: same as data range |
| Type:                   | Measured                |                                       |
| Supporting Information: |                         |                                       |
| PGN reference:          | 65264                   |                                       |

**SPN 188                      Engine Speed At Idle, Point 1 (Engine Configuration)**

Stationary low idle speed of engine which includes influences due to engine temperature (after power up) and other stationary changes (calibration offsets, sensor failures, etc). This parameter is point 1 of the engine configuration map (see PGN 65251).

|                         |                         |                                       |
|-------------------------|-------------------------|---------------------------------------|
| Data Length:            | 2 bytes                 |                                       |
| Resolution:             | 0.125 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 8,031.875 rpm      | Operational Range: same as data range |
| Type:                   | Measured                |                                       |
| Supporting Information: |                         |                                       |
| PGN reference:          | 65251                   |                                       |

**SPN 189                      Engine Rated Speed**

The maximum governed rotational velocity of the engine crankshaft under full load conditions. Note that the engine speed at point 2 (SPN 528) is equal to rated engine speed only in the case when the engine has not been derated. Please also reference PGN 65251.

|                         |                         |                                       |
|-------------------------|-------------------------|---------------------------------------|
| Data Length:            | 2 bytes                 |                                       |
| Resolution:             | 0.125 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 8,031.875 rpm      | Operational Range: same as data range |
| Type:                   | Measured                |                                       |
| Supporting Information: |                         |                                       |
| PGN reference:          | 65214                   |                                       |

**SPN 190            Engine Speed**

Actual engine speed which is calculated over a minimum crankshaft angle of 720 degrees divided by the number of cylinders.

|                         |                         |                                       |
|-------------------------|-------------------------|---------------------------------------|
| Data Length:            | 2 bytes                 |                                       |
| Resolution:             | 0.125 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 8,031.875 rpm      | Operational Range: same as data range |
| Type:                   | Measured                |                                       |
| Supporting Information: |                         |                                       |
| PGN reference:          | 61444                   |                                       |

**SPN 191            Transmission Output Shaft Speed**

Calculated speed of the transmission output shaft.

|                         |                         |                                       |
|-------------------------|-------------------------|---------------------------------------|
| Data Length:            | 2 bytes                 |                                       |
| Resolution:             | 0.125 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 8,031.875 rpm      | Operational Range: same as data range |
| Type:                   | Measured                |                                       |
| Supporting Information: |                         |                                       |
| PGN reference:          | 61442                   |                                       |

**SPN 233            Unit Number (Power Unit)**

Owner assigned unit number for the power unit of the vehicle.

NOTE: The ASCII character "\*" is reserved as a delimiter.

|                         |                                                         |                                       |
|-------------------------|---------------------------------------------------------|---------------------------------------|
| Data Length:            | Variable - up to 200 bytes followed by an "*" delimiter |                                       |
| Resolution:             | ASCII, 0 offset                                         |                                       |
| Data Range:             | 0 to 255 per byte                                       | Operational Range: same as data range |
| Type:                   | Measured                                                |                                       |
| Supporting Information: |                                                         |                                       |
| PGN reference:          | 65259                                                   |                                       |

**SPN 234            Software Identification**

Software identification of an electronic module. As an example, this parameter may be represented with ASCII characters MMDDYYaa where MM is the month, DD is the day, YY is the year, and aa is the revision number.

NOTE The ASCII character "\*" is reserved as a delimiter.

|                         |                                                         |                                       |
|-------------------------|---------------------------------------------------------|---------------------------------------|
| Data Length:            | Variable - up to 200 bytes followed by an "*" delimiter |                                       |
| Resolution:             | ASCII, 0 offset                                         |                                       |
| Data Range:             | 0 to 255 per byte                                       | Operational Range: same as data range |
| Type:                   | Measured                                                |                                       |
| Supporting Information: |                                                         |                                       |
| PGN reference:          | 65242                                                   |                                       |



**SPN 235            Engine Total Idle Hours**

Accumulated time of operation of the engine while under idle conditions.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.05 hr/bit, 0 offset  |                                       |
| Data Range:             | 0 to 210,554,060.75 hr | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65244                  |                                       |

**SPN 236            Engine Total Idle Fuel Used**

Accumulated amount of fuel used during vehicle operation while under idle conditions.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.5 L/bit, 0 offset    |                                       |
| Data Range:             | 0 to 2,105,540,607.5 L | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65244                  |                                       |

**SPN 237            Vehicle Identification Number**

Vehicle Identification Number (VIN) as assigned by the vehicle manufacturer.

NOTE The ASCII character "\*" is reserved as a delimiter.

|                         |                                                         |                                       |
|-------------------------|---------------------------------------------------------|---------------------------------------|
| Data Length:            | Variable - up to 200 bytes followed by an "*" delimiter |                                       |
| Resolution:             | ASCII, 0 offset                                         |                                       |
| Data Range:             | 0 to 255 per byte                                       | Operational Range: same as data range |
| Type:                   | Measured                                                |                                       |
| Supporting Information: |                                                         |                                       |
| PGN reference:          | 65260                                                   |                                       |

**SPN 241            Tire Pressure**

Pressure at which air is contained in cavity formed by tire and rim.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 4 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 1000 kPa       | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65268               |                                       |

**SPN 242      *Tire Temperature***

Temperature at the surface of the tire sidewall.

|                         |                                      |                                       |
|-------------------------|--------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                              |                                       |
| Resolution:             | 0.03125 deg C/bit, -273 deg C offset |                                       |
| Data Range:             | -273 to 1734.96875 deg C             | Operational Range: same as data range |
| Type:                   | Measured                             |                                       |
| Supporting Information: |                                      |                                       |
| PGN reference:          | 65268                                |                                       |

**SPN 244      *Trip Distance***

Distance traveled during all or part of a journey.

NOTE See SPN 918 for alternate resolution.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.125 km/bit, 0 offset |                                       |
| Data Range:             | 0 to 526,385,151.9 km  | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65248                  |                                       |

**SPN 245      *Total Vehicle Distance***

Accumulated distance traveled by vehicle during its operation.

NOTE See SPN 917 for alternate resolution.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.125 km/bit, 0 offset |                                       |
| Data Range:             | 0 to 526,385,151.9 km  | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65248                  |                                       |

**SPN 246      *Total Vehicle Hours***

Accumulated time of operation of vehicle.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.05 hr/bit, 0 offset  |                                       |
| Data Range:             | 0 to 210,554,060.75 hr | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65255                  |                                       |

**SPN 247            Engine Total Hours of Operation**

Accumulated time of operation of engine.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.05 hr/bit, 0 offset  |                                       |
| Data Range:             | 0 to 210,554,060.75 hr | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65253                  |                                       |

**SPN 248            Total Power Takeoff Hours**

Accumulated time of operation of power takeoff device.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.05 hr/bit, 0 offset  |                                       |
| Data Range:             | 0 to 210,554,060.75 hr | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65255                  |                                       |

**SPN 249            Engine Total Revolutions**

Accumulated number of revolutions of engine crankshaft during its operation.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 4 bytes                  |                                       |
| Resolution:             | 1000 r/bit, 0 offset     |                                       |
| Data Range:             | 0 to 4,211,081,215,000 r | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65253                    |                                       |

**(R) SPN 250        Engine Total Fuel Used**

Accumulated amount of fuel used during vehicle operation. See SPN 5054 for alternate resolution.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.5 L/bit, 0 offset    |                                       |
| Data Range:             | 0 to 2,105,540,607.5 L | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65257                  |                                       |

**SPN 354                      Relative Humidity**

Measures humidity of combustion air prior to entry into turbocharger

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65164               |                                       |

**SPN 407                      Axle Group Full Weight Calibration**

The full weight calibration measurement of an axle group

|                         |                    |                                       |
|-------------------------|--------------------|---------------------------------------|
| Data Length:            | 2 bytes            |                                       |
| Resolution:             | 2 kg/bit, 0 offset |                                       |
| Data Range:             | 0 to 128,510 kg    | Operational Range: same as data range |
| Type:                   | Measured           |                                       |
| Supporting Information: |                    |                                       |
| PGN reference:          | 64873              |                                       |

**SPN 408                      Axle Group Empty Weight Calibration**

The empty weight calibration measurement of an axle group

|                         |                    |                                       |
|-------------------------|--------------------|---------------------------------------|
| Data Length:            | 2 bytes            |                                       |
| Resolution:             | 2 kg/bit, 0 offset |                                       |
| Data Range:             | 0 to 128,510 kg    | Operational Range: same as data range |
| Type:                   | Measured           |                                       |
| Supporting Information: |                    |                                       |
| PGN reference:          | 64873              |                                       |

**SPN 409                      Axle Group Weight**

Total mass imposed on the road surface by all the tires in the axle group

|                         |                    |                                       |
|-------------------------|--------------------|---------------------------------------|
| Data Length:            | 2 bytes            |                                       |
| Resolution:             | 2 kg/bit, 0 offset |                                       |
| Data Range:             | 0 to 128,510 kg    | Operational Range: same as data range |
| Type:                   | Measured           |                                       |
| Supporting Information: |                    |                                       |
| PGN reference:          | 64874              |                                       |

**(R) SPN 411      Engine Exhaust Gas Recirculation 1 Differential Pressure**

Differential pressure across the Exhaust Gas Recirculation (EGR) system

Data Length: 2 bytes  
Resolution: 1/128 kPa/bit, -250 kPa offset  
Data Range: -250 kPa TO 251.99 kPa      Operational Range: same as data range  
Type: Measured  
Supporting Information: See Appendix D - SPN 27  
PGN reference: 65188

**(R) SPN 412      Engine Exhaust Gas Recirculation 1 Temperature**

Temperature of Recirculated Exhaust Gas. This should not be used for Exhaust Gas Recirculation Mixer Intake Temperature. See SPN 5020.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information: See Appendix D - SPN 27  
PGN reference: 65188

**SPN 413      Net Vehicle Weight Change**

Identifies the net vehicle weight change from the time of last vehicle net weight zeroing.

Data Length: 3 bytes  
Resolution: 2 kg/bit, -16,449,535 offset  
Data Range: -16,449,535 to 16,449,535 kg      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 64872

**SPN 417      Gross Combination Weight**

Total weight of the truck and all the trailers with on-board scales.

Data Length: 3 bytes  
Resolution: 2 kg/bit, 0 offset  
Data Range: 0 to 32,899,070 kg      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 64872

**SPN 441            Auxiliary Temperature 1**

Temperature measured by auxiliary temperature sensor #1. Not to be used in place of existing SPNs.

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 deg C/bit, -40 deg C offset |                                       |
| Data Range:             | -40 to 210 deg C              | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          | 65164                         |                                       |

**SPN 442            Auxiliary Temperature 2**

Temperature measured by auxiliary temperature sensor #2. Not to be used in place of existing SPNs.

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 deg C/bit, -40 deg C offset |                                       |
| Data Range:             | -40 to 210 deg C              | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          | 65164                         |                                       |

**SPN 444            Battery Potential / Power Input 2**

This parameter measures the second source of battery potential as measured at the input of the ECM/actuator etc. coming from one or more batteries, irrespective of the distance between the component and the battery. This SPN is also used when ECM's are interconnected in a series configuration, where the source of power is coming directly or indirectly from the same battery/batteries.

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bytes                    |                                       |
| Resolution:             | 0.05 V/bit, 0 offset       |                                       |
| Data Range:             | 0 to 3212.75 V             | Operational Range: same as data range |
| Type:                   | Measured                   |                                       |
| Supporting Information: | See Appendix D - PGN 65104 |                                       |
| PGN reference:          | 65165                      |                                       |

**(R) SPN 509            Milepost Identification**

Used to identify the milepost as detected by a milepost sensor. The length of the ASCII text for this parameter must be reported using SPN 3070 (Number of bytes in the Milepost Identification).

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | Variable - up to 100 bytes |                                       |
| Resolution:             | ASCII, 0 offset            |                                       |
| Data Range:             | 0 to 255 per byte          | Operational Range: same as data range |
| Type:                   | Measured                   |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 64959                      |                                       |

**SPN 512            Driver's Demand Engine - Percent Torque**

The requested torque output of the engine by the driver. It is based on input from the following requestors external to the powertrain: operator (via the accelerator pedal), cruise control and/or road speed limit governor. Dynamic commands from

internal powertrain functions such as smoke control, low- and high-speed engine governing; ASR and shift control are excluded from this calculation. The data is transmitted in indicated torque as a percent of the reference engine torque. See PGN 65251 for the engine configuration message. Several status bits are defined separately to indicate the request which is currently being honored. This parameter may be used for shift scheduling.

|                         |                          |                              |
|-------------------------|--------------------------|------------------------------|
| Data Length:            | 1 byte                   |                              |
| Resolution:             | 1 %/bit, -125 % offset   |                              |
| Data Range:             | -125 to 125 %            | Operational Range: 0 to 125% |
| Type:                   | Measured                 |                              |
| Supporting Information: | See Appendix D - SPN 512 |                              |
| PGN reference:          | 61444                    |                              |

### **SPN 513**      ***Actual Engine - Percent Torque***

The calculated output torque of the engine. The data is transmitted in indicated torque as a percent of reference engine torque (see the engine configuration message, PGN 65251). The engine percent torque value will not be less than zero and it includes the torque developed in the cylinders required to overcome friction.

|                         |                        |                              |
|-------------------------|------------------------|------------------------------|
| Data Length:            | 1 byte                 |                              |
| Resolution:             | 1 %/bit, -125 % offset |                              |
| Data Range:             | -125 to 125 %          | Operational Range: 0 to 125% |
| Type:                   | Measured               |                              |
| Supporting Information: |                        |                              |
| PGN reference:          | 61444                  |                              |

### **(R) SPN 514**      ***Nominal Friction - Percent Torque***

The calculated torque that indicates the amount of torque required by the basic engine itself added by the loss torque of accessories. It contains the frictional and thermodynamic loss of the engine itself, pumping torque loss (SPN 5398), and the losses of fuel, oil and cooling pumps. The data is transmitted in indicated torque as a percent of reference engine torque (see the engine configuration message, PGN 65251).

The realization can be done by a map dependent on engine speed and engine temperature and an offset value for additional loss torques.

See SPN 2978 for an indicator that describes the possible inclusion of engine parasitic losses such as cooling fan, etc. in this parameter value.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 1 %/bit, -125 % offset |                                       |
| Data Range:             | -125 to 125 %          | Operational Range: same as data range |
| Type:                   | Status                 |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65247                  |                                       |

**SPN 515                      Engine's Desired Operating Speed**

An indication by the engine of the optimal operating speed of the engine for the current existing conditions. These conditions may include the torque generated to accommodate powertrain demands from the operator (via the accelerator pedal), cruise control, road speed limit governors, or ASR. Dynamic commands from functions such as smoke control or shift control are excluded from this calculation.

|                         |                         |                                                         |
|-------------------------|-------------------------|---------------------------------------------------------|
| Data Length:            | 2 bytes                 |                                                         |
| Resolution:             | 0.125 rpm/bit, 0 offset |                                                         |
| Data Range:             | 0 to 8,031.875 rpm      | Operational Range: (upper byte resolution = 32 rpm/bit) |
| Type:                   | Status                  |                                                         |
| Supporting Information: |                         |                                                         |
| PGN reference:          | 65247                   |                                                         |

**SPN 517                      Navigation-Based Vehicle Speed**

Speed of the vehicle as calculated from a device such as a Global Positioning System (GPS).

|                         |                              |                                       |
|-------------------------|------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                      |                                       |
| Resolution:             | 1/256 km/h per bit, 0 offset |                                       |
| Data Range:             | 0 to 250.996 km/h            | Operational Range: same as data range |
| Type:                   | Measured                     |                                       |
| Supporting Information: |                              |                                       |
| PGN reference:          | 65256                        |                                       |



**SPN 518                      Engine Requested Torque/Torque Limit**

Parameter provided to the engine or retarder in the torque/speed control message for controlling or limiting the output torque.

Requested torque to the engine is measured in indicated torque as a percentage of reference engine torque (see the engine configuration message, PGN 65251). This is the engine torque at which the engine is expected to operate if the torque control mode is active or the engine torque which the engine is not expected to exceed if the torque limit mode is active.

Zero torque can be requested which implies zero fuel and, according to Figures SPN512\_A and SPN512\_B, the engine will not be allowed to stall. The actual engine percent torque (SPN 513) should be zero and the engine should decelerate until the low idle governor kicks in, at which time the actual engine percent torque will be calculated as shown in Figures SPN512\_A and SPN512\_B and the engine torque mode bits (SPN 899) should be equal to 0000b - Low Idle Governor.

Requested torque to the retarder is measured in indicated torque as a percentage of reference retarder torque (see the retarder configuration message, PGN 65249). The logic used in enabling or disabling the retarder is based on the override control mode priority bits (SPN 897).

A zero torque request to the retarder is a disable request, and is used by a J1939 node to prevent the retarder from being activated by other combinations of inputs outside of J1939 commands. The Torque Limit Mode is commonly used for this purpose.

|                         |                          |                                                                                               |
|-------------------------|--------------------------|-----------------------------------------------------------------------------------------------|
| Data Length:            | 1 byte                   |                                                                                               |
| Resolution:             | 1 %/bit, -125 % offset   |                                                                                               |
| Data Range:             | -125 to 125 %            | Operational Range: 0 to 125% engine torque requests, -125% to 0% for retarder torque requests |
| Type:                   | Status                   |                                                                                               |
| Supporting Information: | See Appendix D - SPN 518 |                                                                                               |
| PGN reference:          | 0                        |                                                                                               |

**SPN 519                      Engine's Desired Operating Speed Asymmetry Adjustment**

This byte is utilized in transmission gear selection routines and indicates the engine's preference of lower versus higher engine speeds should its desired speed not be achievable. This is a scaled ratio such that 125 represents an equal preference for a speed lower or higher than the engine's indicated desired speed. The higher the asymmetry adjustment value is above 125, the more the engine prefers to be operated at or above its indicated desired speed. Conversely, the lower the asymmetry adjustment value is below 125, the more the engine prefers to operate at or below its indicated desired speed. Typically, the engine's asymmetry adjustment will be predicated on fuel consumption considerations, and under these conditions, the method for computing the asymmetry adjustment is indicated in Figure SPN519\_A. The engine may include other factors into its asymmetry adjustment calculation such as temperatures, pressures, and other operating parameters.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 1 byte                   |                                       |
| Resolution:             | 1/bit, 0 offset          |                                       |
| Data Range:             | 0 to 250                 | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: | See Appendix D - SPN 519 |                                       |
| PGN reference:          | 65247                    |                                       |

**SPN 520      Actual Retarder - Percent Torque**

Actual braking torque of the retarder as a percent of retarder configuration reference torque SPN 556.

Data Length: 1 byte  
Resolution: 1 %/bit, -125 % offset  
Data Range: -125 to 125 %      Operational Range: -125% to 0 %  
Type: Measured  
Supporting Information:  
PGN reference: 61440

**SPN 521      Brake Pedal Position**

Ratio of brake pedal position to maximum pedal position. Used for electric brake applications. 0% means no braking. Also when there are two brake pedals on the machine (Left Brake Pedal Position SPN 3033 and Right Brake Pedal Position SPN 3032) the maximum of the two should be transmitted for Brake Pedal Position.

Data Length: 1 byte  
Resolution: 0.4 %/bit, 0 offset  
Data Range: 0 to 100 %      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 61441

**SPN 522      Percent Clutch Slip**

Parameter which represents the ratio of input shaft speed to current engine speed (in percent).

Percent Clutch Slip = ((Engine rpm - Input shaft rpm)/(Engine rpm)) x 100

Data Length: 1 byte  
Resolution: 0.4 %/bit, 0 offset  
Data Range: 0 to 100 %      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 61442

**SPN 523      Transmission Current Gear**

The gear currently engaged in the transmission or the last gear engaged while the transmission is in the process of shifting to the new or selected gear. Transitions toward a destination gear will not be indicated. Once the selected gear has been engaged then Transmission Current Gear (SPN 525) will reflect that gear.

Data Length: 1 byte  
Resolution: 1 gear value/bit, -125 offset  
Data Range: -125 to 125      Operational Range: -125 to +125, negative values are reverse gears, positive values are forward gears, zero is neutral. 251 (0xFB) is park.  
Type: Measured  
Supporting Information:  
PGN reference: 61445

**SPN 524*****Transmission Selected Gear***

The gear that the transmission will attempt to achieve during the current shift if a shift is in progress, or the next shift if one is pending (i.e., waiting for torque reduction to initiate the shift).

Data Length: 1 byte

Resolution: 1 gear value/bit, -125 offset

Data Range: -125 to 125

Operational Range: -125 to +125, negative values are reverse gears, positive values are forward gears, zero is neutral. 251 (0xFB) is park.

Type: Status

Supporting Information:

PGN reference: 61445

**SPN 525                      Transmission Requested Gear**

Gear requested by the operator, ABS, or engine.

Negative values are reverse gears, positive values are forward gears, zero is neutral, parameter specific indicators are listed below.

Parameter specific values for this parameter are as follows:

0xFD (253 dec) = Hold current gear  
 0xFC (252 dec) = Forward Drive Position  
 0xFB (251 dec) = 'Park' position  
 0xFA (250 dec) = Forward 'Low' position  
 0xF9 (249 dec) = Upshift 1 gear from current position  
 0xF8 (248 dec) = Upshift 2 gears from current position  
 0xF7 (247 dec) = Downshift 1 gear from current position  
 0xF6 (246 dec) = Downshift 2 gears from current position  
 0xF5 (245 dec) = D-1: 1st forward selector position referenced from 'Drive'  
 0xF4 (244 dec) = D-2: 2nd forward selector position referenced from 'Drive'  
 0xF3 (243 dec) = D-3: 3rd forward selector position referenced from 'Drive'  
 0xF2 (242 dec) = D-4: 4th forward selector position referenced from 'Drive'  
 0xF1 (241 dec) = D-5: 5th forward selector position referenced from 'Drive'  
 0xF0 (240 dec) = D-6: 6th forward selector position referenced from 'Drive'  
 0xEF (239 dec) = D-7: 7th forward selector position referenced from 'Drive'  
 0xEE (238 dec) = Between two shift selector positions (if detail is unknown)  
 0xED (237 dec) = Between two reverse shift selector positions  
 0xEC (236 dec) = Between two forward shift selector positions  
 0xEB (235 dec) = Between D-7 and D-6 shift selector positions  
 0xEA (234 dec) = Between D-6 and D-5 shift selector positions  
 0xE9 (233 dec) = Between D-5 and D-4 shift selector positions  
 0xE8 (232 dec) = Between D-4 and D-3 shift selector positions  
 0xE7 (231 dec) = Between D-3 and D-2 shift selector positions  
 0xE6 (230 dec) = Between D-2 and D-1 shift selector positions  
 0xE5 (229 dec) = Between D-1 and 'Drive' shift selector positions  
 0xE4 (228 dec) = Between 'Drive' and 'Neutral' shift selector positions  
 0xE3 (227 dec) = Between 'Neutral' and 'Reverse' shift selector positions  
 0xE2 (226 dec) = Between 'Reverse' and 'Park' shift selector positions  
 0xE1 (225 dec) = Press of momentary button to reselect current position  
 0xE0 (224 dec) = Position unknown and/or no buttons pressed  
 0xDF (223 dec) = Reverse Selector Position

0xDE - 0xBE (222 dec - 190 dec) = Reserved

0x3C - 0x00 (60 dec - 0 dec) = Reserved

Forward selector position from drive (0xF5 to 0xEF) – Indicates shift selector position in reference to the 'Drive' position on the selector. It is possible that the shift selector software may not know the number of forward ranges. The shift selector may identify the position selected by the operator while the transmission ECU determines what range or gear that represents. If there is a digital display, the transmission ECU would communicate what is to be displayed via another message such as ETC#2 or ETC#7.

For example: Consider a vehicle with a 5-speed automatic transmission with the shift lever on the column. Suppose that shift selector has a limited number of positions, such that having positions for D-4-3-2-1 is not an option. For this example, assume there are only have enough lever positions for D-3-2-1. Pulling the lever into "D" will put the transmission in 5th (highest gear). It is desired that pulling the lever to the physical "3" position will limit the transmission to a maximum range of 3rd gear.

When the selector is pulled down into "3", the shifter selector itself has no way of correlating this physical lever position to the desired gear; it would have to be calibrated with software to tell it this information. If not calibrated, the shift selector cannot directly command the transmission to go to 3rd gear; it only knows it's one notch below drive.

However, if "D-1" (lever position, as opposed to desired gear) is broadcast by the selector, the transmission ECU can receive this and then make the determination of what range is desired. The benefit is that no specific calibration of the shift selector is required.

Between selector positions (0xEE to 0xE2) – Indicates the shift selector is not in an appropriate position. If a lever-type shift selector with a mechanical display is stuck between detents, it may appear to the operator that it is in the desired position when in fact it is not. The shift selector may be capable of reporting only that it is between positions or that it is between forward or reverse positions. If known, the transmission ECU may respond differently depending on which positions are involved.

Reselect current position (0xE1) - If the TC1 message continues to send the position last selected, then a capability to reselect the same position is required. For example: If a 'Neutral to Drive' shift is selected and that shift is inhibited (say for high engine speed), it may be necessary for the operator to reselect 'Drive' after the inhibit conditions pass in order for the transmission ECU to honor the request.

Position unknown and/or no buttons pressed (0xE0) - A push-button style shift selector with momentary contact buttons may send this indicator after initialization before any buttons are pressed, or before the transmission ECU determines and communicates the initial selection. This indicator could also be sent between button presses as an alternative to sending the last button press.

|                         |                               |                              |
|-------------------------|-------------------------------|------------------------------|
| Data Length:            | 1 byte                        |                              |
| Resolution:             | 1 gear value/bit, -125 offset |                              |
| Data Range:             | -125 to 125                   | Operational Range: -64 to 64 |
| Type:                   | Status                        |                              |
| Supporting Information: |                               |                              |
| PGN reference:          | 256                           |                              |

#### **SPN 526                      *Transmission Actual Gear Ratio***

Actual ratio of input shaft speed to output shaft speed.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 2 bytes             |                                       |
| Resolution:             | 0.001/bit, 0 offset |                                       |
| Data Range:             | 0 to 64.255         | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 61445               |                                       |



**SPN 530                    Engine Speed At Point 4 (Engine Configuration)**

Engine speed of point 3, 4, and 5 of the engine torque map (see PGN 65251 and supporting document). It is recommended that one of these points indicate the peak torque point for the current engine torque map. Points 3, 4, and 5 are optional and lie between idle and point 2.

|                         |                         |                                       |
|-------------------------|-------------------------|---------------------------------------|
| Data Length:            | 2 bytes                 |                                       |
| Resolution:             | 0.125 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 8,031.875 rpm      | Operational Range: same as data range |
| Type:                   | Measured                |                                       |
| Supporting Information: |                         |                                       |
| PGN reference:          | 65251                   |                                       |

**SPN 531                    Engine Speed At Point 5 (Engine Configuration)**

Engine speed of point 3, 4, and 5 of the engine torque map (see PGN 65251 and supporting document). It is recommended that one of these points indicate the peak torque point for the current engine torque map. Points 3, 4, and 5 are optional and lie between idle and point 2.

|                         |                         |                                       |
|-------------------------|-------------------------|---------------------------------------|
| Data Length:            | 2 bytes                 |                                       |
| Resolution:             | 0.125 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 8,031.875 rpm      | Operational Range: same as data range |
| Type:                   | Measured                |                                       |
| Supporting Information: |                         |                                       |
| PGN reference:          | 65251                   |                                       |

**SPN 532                    Engine Speed At High Idle, Point 6 (Engine Configuration)**

Engine speed of high idle (point 6) of the engine torque map (see PGN 65251 and supporting document). In engine configuration mode 3 (see Figure PGN65251\_C), point 6 is not defined by the engine torque map but by the governor characteristic and the zero torque line.

|                         |                         |                                       |
|-------------------------|-------------------------|---------------------------------------|
| Data Length:            | 2 bytes                 |                                       |
| Resolution:             | 0.125 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 8,031.875 rpm      | Operational Range: same as data range |
| Type:                   | Measured                |                                       |
| Supporting Information: |                         |                                       |
| PGN reference:          | 65251                   |                                       |

**SPN 533                    Engine Maximum Momentary Override Speed, Point 7 (Engine Configuration)**

The maximum engine speed above high idle allowed by the engine control during a momentary high idle override. This duration of the override is limited by the maximum momentary override time limit, SPN 534.

|                         |                         |                                       |
|-------------------------|-------------------------|---------------------------------------|
| Data Length:            | 2 bytes                 |                                       |
| Resolution:             | 0.125 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 8,031.875 rpm      | Operational Range: same as data range |
| Type:                   | Measured                |                                       |
| Supporting Information: |                         |                                       |
| PGN reference:          | 65251                   |                                       |

**SPN 534      Engine Maximum Momentary Override Time Limit (Engine Configuration)**

The maximum time limit allowed to override the engine's high idle speed.

|                         |                     |                                                                                                                  |
|-------------------------|---------------------|------------------------------------------------------------------------------------------------------------------|
| Data Length:            | 1 byte              |                                                                                                                  |
| Resolution:             | 0.1 s/bit, 0 offset |                                                                                                                  |
| Data Range:             | 0 to 25 s           | Operational Range: 0 to 25 sec, 0 = no override of high idle allowed, 255 = not applicable (no time restriction) |
| Type:                   | Measured            |                                                                                                                  |
| Supporting Information: |                     |                                                                                                                  |
| PGN reference:          | 65251               |                                                                                                                  |

**SPN 535      Engine Requested Speed Control Range Lower Limit (Engine Configuration)**

The minimum engine speed that the engine will allow when operating in a speed control/limit mode.

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 1 byte               |                                       |
| Resolution:             | 10 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 2,500 rpm       | Operational Range: same as data range |
| Type:                   | Measured             |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 65251                |                                       |

**SPN 536      Engine Requested Speed Control Range Upper Limit (Engine Configuration)**

The maximum engine speed regardless of load that the engine will allow when operating in a speed control/limit mode, excluding any maximum momentary engine override speed, if supported.

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 1 byte               |                                       |
| Resolution:             | 10 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 2,500 rpm       | Operational Range: same as data range |
| Type:                   | Measured             |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 65251                |                                       |

**SPN 537      Engine Requested Torque Control Range Lower Limit (Engine Configuration)**

The minimum engine torque that the engine will allow when operating in a torque control/limit mode.

|                         |                        |                              |
|-------------------------|------------------------|------------------------------|
| Data Length:            | 1 byte                 |                              |
| Resolution:             | 1 %/bit, -125 % offset |                              |
| Data Range:             | -125 to 125 %          | Operational Range: 0 to 125% |
| Type:                   | Measured               |                              |
| Supporting Information: |                        |                              |
| PGN reference:          | 65251                  |                              |



**SPN 538                    Engine Requested Torque Control Range Upper Limit (Engine Configuration)**

The maximum engine torque that the engine will allow when operating in a torque control/limit mode.

|                         |                        |                              |
|-------------------------|------------------------|------------------------------|
| Data Length:            | 1 byte                 |                              |
| Resolution:             | 1 %/bit, -125 % offset |                              |
| Data Range:             | -125 to 125 %          | Operational Range: 0 to 125% |
| Type:                   | Measured               |                              |
| Supporting Information: |                        |                              |
| PGN reference:          | 65251                  |                              |

**SPN 539                    Engine Percent Torque At Idle, Point 1 (Engine Configuration)**

The torque limit that indicates the available engine torque which can be provided by the engine at idle speed. This parameter may be influenced by engine temperature (after power up) and other stationary changes (calibration offsets, sensor failures, etc.) See also SPN 188. The data is transmitted in indicated torque as a percent of the reference engine torque.

|                         |                        |                              |
|-------------------------|------------------------|------------------------------|
| Data Length:            | 1 byte                 |                              |
| Resolution:             | 1 %/bit, -125 % offset |                              |
| Data Range:             | -125 to 125 %          | Operational Range: 0 to 125% |
| Type:                   | Measured               |                              |
| Supporting Information: |                        |                              |
| PGN reference:          | 65251                  |                              |

**SPN 540                    Engine Percent Torque At Point 2 (Engine Configuration)**

The torque limit that indicates the available engine torque which can be provided by the engine at point 2 of the engine map (see PGN 65251 and supporting documents). In engine configuration mode 1 and 3 (see Table PGN65251\_A see PGN 65251), point 2 is defined as the kick-in point from which torque is reduced to zero. In mode 2, there are no special requirements for the definition of this point. The data is transmitted in indicated torque as a percent of the reference engine torque.

|                         |                        |                              |
|-------------------------|------------------------|------------------------------|
| Data Length:            | 1 byte                 |                              |
| Resolution:             | 1 %/bit, -125 % offset |                              |
| Data Range:             | -125 to 125 %          | Operational Range: 0 to 125% |
| Type:                   | Measured               |                              |
| Supporting Information: |                        |                              |
| PGN reference:          | 65251                  |                              |

**SPN 541                    Engine Percent Torque At Point 3 (Engine Configuration)**

The torque limit that indicates the available engine torque which can be provided by the engine at point 3, 4, and 5 of the engine map (see PGN 65251 and supporting documents).. It is required that one of these points indicate the peak torque point for the current engine torque map. Points 3, 4, and 5 lie between idle and point 2. The data is transmitted in indicated torque as a percent of the reference engine torque.

|                         |                        |                              |
|-------------------------|------------------------|------------------------------|
| Data Length:            | 1 byte                 |                              |
| Resolution:             | 1 %/bit, -125 % offset |                              |
| Data Range:             | -125 to 125 %          | Operational Range: 0 to 125% |
| Type:                   | Measured               |                              |
| Supporting Information: |                        |                              |
| PGN reference:          | 65251                  |                              |

**SPN 542      Engine Percent Torque At Point 4 (Engine Configuration)**

The torque limit that indicates the available engine torque which can be provided by the engine at point 3, 4, and 5 of the engine map (see PGN 65251 and supporting documents). It is required that one of these points indicate the peak torque point for the current engine torque map. Points 3, 4, and 5 lie between idle and point 2. The data is transmitted in indicated torque as a percent of the reference engine torque.

|                         |                        |                              |
|-------------------------|------------------------|------------------------------|
| Data Length:            | 1 byte                 |                              |
| Resolution:             | 1 %/bit, -125 % offset |                              |
| Data Range:             | -125 to 125 %          | Operational Range: 0 to 125% |
| Type:                   | Measured               |                              |
| Supporting Information: |                        |                              |
| PGN reference:          | 65251                  |                              |

**SPN 543      Engine Percent Torque At Point 5 (Engine Configuration)**

The torque limit that indicates the available engine torque which can be provided by the engine at point 3, 4, and 5 of the engine map (see PGN 65251 and supporting documents). It is required that one of these points indicate the peak torque point for the current engine torque map. Points 3, 4, and 5 lie between idle and point 2. The data is transmitted in indicated torque as a percent of the reference engine torque.

|                         |                        |                              |
|-------------------------|------------------------|------------------------------|
| Data Length:            | 1 byte                 |                              |
| Resolution:             | 1 %/bit, -125 % offset |                              |
| Data Range:             | -125 to 125 %          | Operational Range: 0 to 125% |
| Type:                   | Measured               |                              |
| Supporting Information: |                        |                              |
| PGN reference:          | 65251                  |                              |

**SPN 544      Engine Reference Torque (Engine Configuration)**

This parameter is the 100% reference value for all defined indicated engine torque parameters. It is only defined once and doesn't change if a different engine torque map becomes valid.

|                         |                    |                                       |
|-------------------------|--------------------|---------------------------------------|
| Data Length:            | 2 bytes            |                                       |
| Resolution:             | 1 Nm/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 Nm     | Operational Range: same as data range |
| Type:                   | Measured           |                                       |
| Supporting Information: |                    |                                       |
| PGN reference:          | 65251              |                                       |

**SPN 545      *Engine Gain (Kp) Of The Endspeed Governor (Engine Configuration)***

The endspeed governor is defined as a linear line with the following equations (Capital letters mean physical values, small letters mean normalized values). Refer to Figures PGN65251\_A and PGN65251\_B.

The gain KP/kp is defined as a positive value. The factor 4096 is necessary for realizing flat curves with sufficient resolution as well as very steep curves.

KP = delta Torque / delta Speed

kp (normalized) = KP \* 250/100% \* 8031 rpm/64255 \* 4096 = KP \* 1280 rpm/%

|                         |                                |                                       |
|-------------------------|--------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                        |                                       |
| Resolution:             | 1/1280 %/rpm per bit, 0 offset |                                       |
| Data Range:             | 0 to 50.2 %/rpm                | Operational Range: same as data range |
| Type:                   | Measured                       |                                       |
| Supporting Information: |                                |                                       |
| PGN reference:          | 65251                          |                                       |

**SPN 546      *Retarder Speed At Idle, Point 1 (Retarder Configuration)***

Please reference PGN 65249

|                         |                         |                                       |
|-------------------------|-------------------------|---------------------------------------|
| Data Length:            | 2 bytes                 |                                       |
| Resolution:             | 0.125 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 8,031.875 rpm      | Operational Range: same as data range |
| Type:                   | Measured                |                                       |
| Supporting Information: |                         |                                       |
| PGN reference:          | 65249                   |                                       |

**SPN 547      *Retarder Speed At Peak Torque, Point 5 (Retarder Configuration)***

Please reference PGN 65249

|                         |                         |                                       |
|-------------------------|-------------------------|---------------------------------------|
| Data Length:            | 2 bytes                 |                                       |
| Resolution:             | 0.125 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 8,031.875 rpm      | Operational Range: same as data range |
| Type:                   | Measured                |                                       |
| Supporting Information: |                         |                                       |
| PGN reference:          | 65249                   |                                       |

**SPN 548      *Maximum Retarder Speed, Point 2 (Retarder Configuration)***

Maximum speed of retarder (Please reference PGN 65249).

|                         |                         |                                       |
|-------------------------|-------------------------|---------------------------------------|
| Data Length:            | 2 bytes                 |                                       |
| Resolution:             | 0.125 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 8,031.875 rpm      | Operational Range: same as data range |
| Type:                   | Measured                |                                       |
| Supporting Information: |                         |                                       |
| PGN reference:          | 65249                   |                                       |

**SPN 549      Retarder Speed At Point 3 (Retarder Configuration)**

Retarder speed of point 3 of the engine retarder torque map. Please reference PGN 65249.

|                         |                         |                                       |
|-------------------------|-------------------------|---------------------------------------|
| Data Length:            | 2 bytes                 |                                       |
| Resolution:             | 0.125 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 8,031.875 rpm      | Operational Range: same as data range |
| Type:                   | Measured                |                                       |
| Supporting Information: |                         |                                       |
| PGN reference:          | 65249                   |                                       |

**SPN 550      Retarder Speed At Point 4 (Retarder Configuration)**

Retarder speed of point 4 of the engine retarder torque map. Please reference PGN 65249.

|                         |                         |                                       |
|-------------------------|-------------------------|---------------------------------------|
| Data Length:            | 2 bytes                 |                                       |
| Resolution:             | 0.125 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 8,031.875 rpm      | Operational Range: same as data range |
| Type:                   | Measured                |                                       |
| Supporting Information: |                         |                                       |
| PGN reference:          | 65249                   |                                       |

**SPN 551      Percent Torque At Idle, Point 1 (Retarder Configuration)**

The torque limit that indicates the available retarder torque which can be provided by the retarder at idle speed. The data is transmitted in indicated torque as a percent of the reference retarder torque.

|                         |                        |                               |
|-------------------------|------------------------|-------------------------------|
| Data Length:            | 1 byte                 |                               |
| Resolution:             | 1 %/bit, -125 % offset |                               |
| Data Range:             | -125 to 125 %          | Operational Range: -125 to 0% |
| Type:                   | Measured               |                               |
| Supporting Information: |                        |                               |
| PGN reference:          | 65249                  |                               |

**SPN 552      Percent Torque At Maximum Speed, Point 2 (Retarder Configuration)**

The torque limit that indicates the available retarder torque which can be provided by the retarder at its maximum speed. Please reference PGN 65249. The data is transmitted in indicated torque as a percent of the reference retarder torque.

|                         |                        |                               |
|-------------------------|------------------------|-------------------------------|
| Data Length:            | 1 byte                 |                               |
| Resolution:             | 1 %/bit, -125 % offset |                               |
| Data Range:             | -125 to 125 %          | Operational Range: -125 to 0% |
| Type:                   | Measured               |                               |
| Supporting Information: |                        |                               |
| PGN reference:          | 65249                  |                               |

**SPN 553      *Percent Torque At Point 3 (Retarder Configuration)***

The torque limit that indicates the available retarder torque which can be provided by the retarder at points 3 and 4 of the retarder torque map. Please reference PGN 65249. The data is transmitted in indicated torque as a percent of the reference retarder torque.

|                         |                        |                               |
|-------------------------|------------------------|-------------------------------|
| Data Length:            | 1 byte                 |                               |
| Resolution:             | 1 %/bit, -125 % offset |                               |
| Data Range:             | -125 to 125 %          | Operational Range: -125 to 0% |
| Type:                   | Measured               |                               |
| Supporting Information: |                        |                               |
| PGN reference:          | 65249                  |                               |

**SPN 554      *Percent Torque At Point 4 (Retarder Configuration)***

The torque limit that indicates the available retarder torque which can be provided by the retarder at points 3 and 4 of the retarder torque map. Please reference PGN 65249. The data is transmitted in indicated torque as a percent of the reference retarder torque.

|                         |                        |                               |
|-------------------------|------------------------|-------------------------------|
| Data Length:            | 1 byte                 |                               |
| Resolution:             | 1 %/bit, -125 % offset |                               |
| Data Range:             | -125 to 125 %          | Operational Range: -125 to 0% |
| Type:                   | Measured               |                               |
| Supporting Information: |                        |                               |
| PGN reference:          | 65249                  |                               |

**SPN 555      *Percent Torque At Peak Torque, Point 5 (Retarder Configuration)***

The torque limit that indicates the available retarder torque which can be provided by the retarder at point 5 of the retarder torque map. Please reference PGN 65249. The data is transmitted in indicated torque as a percent of the reference retarder torque.

|                         |                        |                               |
|-------------------------|------------------------|-------------------------------|
| Data Length:            | 1 byte                 |                               |
| Resolution:             | 1 %/bit, -125 % offset |                               |
| Data Range:             | -125 to 125 %          | Operational Range: -125 to 0% |
| Type:                   | Measured               |                               |
| Supporting Information: |                        |                               |
| PGN reference:          | 65249                  |                               |

**SPN 556      *Reference Retarder Torque (Retarder Configuration)***

This parameter is the 100% reference value for all defined indicated retarder torque parameters. It is only defined once and doesn't change if a different retarder torque map becomes valid.

|                         |                    |                                       |
|-------------------------|--------------------|---------------------------------------|
| Data Length:            | 2 bytes            |                                       |
| Resolution:             | 1 Nm/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 Nm     | Operational Range: same as data range |
| Type:                   | Measured           |                                       |
| Supporting Information: |                    |                                       |
| PGN reference:          | 65249              |                                       |

**SPN 557                      Retarder Control Method (Retarder Configuration)**

This parameter identifies the number of steps used by the retarder.

|                         |                      |                                                                                          |
|-------------------------|----------------------|------------------------------------------------------------------------------------------|
| Data Length:            | 1 byte               |                                                                                          |
| Resolution:             | 1 step/bit, 0 offset |                                                                                          |
| Data Range:             | 0 to 250 steps       | Operational Range: 0: continuous control, 1 On/Off control,<br>2 to 250: Number of steps |
| Type:                   | Measured             |                                                                                          |
| Supporting Information: |                      |                                                                                          |
| PGN reference:          | 65249                |                                                                                          |

**SPN 558                      Accelerator Pedal 1 Low Idle Switch**

Switch signal which indicates the state of the accelerator pedal 1 low idle switch. The low idle switch is defined in SAE Recommended Practice J1843.

00 - Accelerator pedal 1 not in low idle condition  
01 - Accelerator pedal 1 in low idle condition  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61443                    |                                       |

**SPN 559                      Accelerator Pedal Kickdown Switch**

Switch signal which indicates whether the accelerator pedal kickdown switch is opened or closed. The kickdown switch is defined in SAE J1843.

00 - Kickdown passive  
01 - Kickdown active  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61443                    |                                       |

**SPN 560                      Transmission Driveline Engaged**

Driveline engaged indicates the transmission controlled portion of the driveline is engaged sufficiently to allow a transfer of torque through the transmission. Driveline engaged is ACTIVE whenever the transmission is in gear and the clutch (if controlled by the transmission controller) is less than 100% clutch slip (clutch able to transfer torque). This parameter should be used in conjunction with the parameter "Shift in Process" (SPN 574). While a shift is in process, the receiver should not assume that the driveline is either fully engaged or disengaged (i.e., cruise control).

00 - Driveline disengaged  
01 - Driveline engaged  
10 - Error  
11 - Not available

Data Length:                2 bits  
Resolution:                4 states/2 bit, 0 offset  
Data Range:                0 to 3  
Type:                        Measured  
Supporting Information:  
PGN reference:            61442

Operational Range: same as data range

**SPN 561                      ASR Engine Control Active**

State signal which indicates that ASR engine control has been commanded to be active. Active means that ASR actually tries to control the engine. This state signal is independent of other control commands to the engine (e.g., from the transmission) which may have higher priority.

00 - ASR engine control passive but installed  
01 - ASR engine control active  
10 - Reserved  
11 - Not available

Data Length:                2 bits  
Resolution:                4 states/2 bit, 0 offset  
Data Range:                0 to 3  
Type:                        Status  
Supporting Information:  
PGN reference:            61441

Operational Range: same as data range

**SPN 562                      ASR Brake Control Active**

State signal which indicates that ASR brake control is active. Active means that ASR actually controls wheel brake pressure at one or more wheels of the driven axle(s).

00 - ASR brake control passive but installed  
01 - ASR brake control active  
10 - Reserved  
11 - Not available

Data Length:                2 bits  
Resolution:                4 states/2 bit, 0 offset  
Data Range:                0 to 3  
Type:                        Status  
Supporting Information:  
PGN reference:            61441

Operational Range: same as data range

**SPN 563                    Anti-Lock Braking (ABS) Active**

State signal which indicates that the ABS is active. The signal is set active when wheel brake pressure actually starts to be modulated by ABS and is reset to passive when all wheels are in a stable condition for a certain time. The signal can also be set active when driven wheels are in high slip (e.g., caused by retarder). Whenever the ABS system is not fully operational (due to a defect or during off-road ABS operation), this signal is only valid for that part of the system that is still working. When ABS is switched off completely, the flag is set to passive regardless of the current wheel slip conditions.

00 - ABS passive but installed  
01 - ABS active  
10 - Reserved  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        61441

Operational Range: same as data range

**SPN 564                    Differential Lock State - Central**

State used which indicates the condition of the central differential lock. The differential locks are located as defined in attached figure SPN564\_A.

00 Differential lock disengaged  
01 Differential lock engaged  
10 Error  
11 Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information: See Appendix D - SPN 564  
PGN reference:        61446

Operational Range: same as data range

**SPN 565                    Differential Lock State - Central Front**

State used which indicates the condition of the central front differential lock. The differential locks are located as defined in figure SPN564\_A.

00 Differential lock disengaged  
01 Differential lock engaged  
10 Error  
11 Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        61446

Operational Range: same as data range



**SPN 566                      Differential Lock State - Central Rear**

State used which indicates the condition of the central rear differential lock. The differential locks are located as defined in figure SPN564\_A.

00 Differential lock disengaged  
01 Differential lock engaged  
10 Error  
11 Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        61446

Operational Range: same as data range

**SPN 567                      Differential Lock State - Front Axle 1**

State used which indicates the condition of the front axle 1 differential lock. The differential locks are located as defined in figure SPN564\_A.

00 Differential lock disengaged  
01 Differential lock engaged  
10 Error  
11 Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        61446

Operational Range: same as data range

**SPN 568                      Differential Lock State - Front Axle 2**

State used which indicates the condition of the front axle 2 differential lock. The differential locks are located as defined in figure SPN 564\_A.

00 Differential lock disengaged  
01 Differential lock engaged  
10 Error  
11 Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        61446

Operational Range: same as data range

**SPN 569                      Differential Lock State - Rear Axle 1**

State used which indicates the condition of the rear axle 1 differential lock. The differential locks are located as defined in figure SPN 564\_A.

00 Differential lock disengaged  
01 Differential lock engaged  
10 Error  
11 Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        61446

Operational Range: same as data range

**SPN 570                      Differential Lock State - Rear Axle 2**

State used which indicates the condition of the rear axle 2 differential lock. The differential locks are located as defined in figure SPN 564\_A.

00 Differential lock disengaged  
01 Differential lock engaged  
10 Error  
11 Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        61446

Operational Range: same as data range

**SPN 571                      Retarder Enable - Brake Assist Switch**

Switch signal which indicates whether the operator wishes the retarder to be enabled for vehicle braking assist. The retarder does not check this switch, nor does the enabling of this switch engage the retarder. When this switch is "enabled," the devices constructing TSC1 – destination retarder messages may command retarder torque for braking. For example, the cruise control should not request retarder torque if this switch is not "enabled." The switch exists to prevent the engine retarder from being asked to be engaged via TSC1 in a noise sensitive area. See also SPN 572

00 Retarder - brake assist disabled  
01 Retarder - brake assist enabled  
10 Error  
11 Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        61440

Operational Range: same as data range

**SPN 572      Retarder Enable - Shift Assist Switch**

Switch signal which indicates whether the operator wishes the retarder to be enabled for transmission shift assist. The retarder does not check this switch, nor does the enabling of this switch engage the retarder. When this switch is "enabled," the transmission may activate the retarder (via the TSC1 message) to increase the rate of engine deceleration to assist in shift control. The switch exists to prevent the engine retarder from being asked to be engaged via TSC1 in a noise sensitive area. See SPN 571.

00 Retarder - shift assist disabled  
01 Retarder - shift assist enabled  
10 Error  
11 Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61440                    |                                       |

**SPN 573      Transmission Torque Converter Lockup Engaged**

State signal which indicates whether the torque converter lockup is engaged.

00 Torque converter lockup disengaged  
01 Torque converter lockup engaged  
10 Error  
11 Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61442                    |                                       |

**SPN 574      Transmission Shift In Process**

Indicates that the transmission is in process of shifting from the current gear to the selected gear. This state is generally ACTIVE during the entire time that the transmission controls the vehicle. This includes any transmission clutch control, all engine control sequences, pulling to transmission neutral, and engaging the destination gear (e.g., until it is no longer sending commands and/or limits to the engine). See also SPN 560. (See Figure SPN574\_A)

00 - Shift is not in process  
01 - Shift in process  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: | See Appendix D - SPN 574 |                                       |
| PGN reference:          | 61442                    |                                       |

**SPN 575                    ABS Off-road Switch**

Switch signal which indicates the position of the ABS off-road switch.

00 - ABS off-road switch passive  
01 - ABS off-road switch active  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        61441

Operational Range: same as data range

**SPN 576                    ASR Off-road Switch**

Switch signal which indicates the position of the ASR off-road switch.

00 - ASR off-road switch passive  
01 - ASR off-road switch active  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        61441

Operational Range: same as data range

**SPN 577                    ASR "Hill Holder" Switch**

Switch signal which indicates the position of the ASR "hill holder" switch.

00 - ASR "hill holder" switch passive  
01 - ASR "hill holder" switch active  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        61441

Operational Range: same as data range

**SPN 578                      Drive Axle Temperature**

Temperature of axle lubricant in drive axle.

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 deg C/bit, -40 deg C offset |                                       |
| Data Range:             | -40 to 210 deg C              | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          | 65273                         |                                       |

**SPN 579                      Drive Axle Lift Air Pressure**

Gage pressure of air in system that utilizes compressed air to provide force between axle and frame.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 4 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 1000 kPa       | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65273               |                                       |

**SPN 580                      Altitude**

Altitude of the vehicle referenced to sea level at standard atmospheric pressure and temperature.

|                         |                             |                                       |
|-------------------------|-----------------------------|---------------------------------------|
| Data Length:            | 2 bytes                     |                                       |
| Resolution:             | 0.125 m/bit, -2500 m offset |                                       |
| Data Range:             | -2500 to 5531.875 m         | Operational Range: same as data range |
| Type:                   | Measured                    |                                       |
| Supporting Information: |                             |                                       |
| PGN reference:          | 65256                       |                                       |

**SPN 581                      Transmission Gear Ratio**

The transmission configuration describes the number of forward gears, the number of reverse gears, and the ratio of each gear with the following resolution.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 2 bytes             |                                       |
| Resolution:             | 0.001/bit, 0 offset |                                       |
| Data Range:             | 0 to 64.255         | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65250               |                                       |

**SPN 582      Axle Weight**

Total mass imposed by the tires on the road surface at the specified axle.

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 2 bytes              |                                       |
| Resolution:             | 0.5 kg/bit, 0 offset |                                       |
| Data Range:             | 0 to 32,127.5 kg     | Operational Range: same as data range |
| Type:                   | Measured             |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 65258                |                                       |

**SPN 583      Pitch**

Pitch of the vehicle as calculated by the navigation device(s).

|                         |                                |                                                               |
|-------------------------|--------------------------------|---------------------------------------------------------------|
| Data Length:            | 2 bytes                        |                                                               |
| Resolution:             | 1/128 deg/bit, -200 deg offset |                                                               |
| Data Range:             | -200 to 301.99 deg             | Operational Range: -200 deg (DECENT) to +301.992 deg (ASCENT) |
| Type:                   | Measured                       |                                                               |
| Supporting Information: |                                |                                                               |
| PGN reference:          | 65256                          |                                                               |

**SPN 584      Latitude**

Latitude position of the vehicle.

|                         |                                    |                                                                |
|-------------------------|------------------------------------|----------------------------------------------------------------|
| Data Length:            | 4 bytes                            |                                                                |
| Resolution:             | $10^{-7}$ deg/bit, -210 deg offset |                                                                |
| Data Range:             | -210 to 211.1008122 deg            | Operational Range: -210 deg (SOUTH) to +211.108122 deg (NORTH) |
| Type:                   | Measured                           |                                                                |
| Supporting Information: |                                    |                                                                |
| PGN reference:          | 65267                              |                                                                |

**SPN 585      Longitude**

Longitude position of the vehicle.

|                         |                                    |                                                              |
|-------------------------|------------------------------------|--------------------------------------------------------------|
| Data Length:            | 4 bytes                            |                                                              |
| Resolution:             | $10^{-7}$ deg/bit, -210 deg offset |                                                              |
| Data Range:             | -210 to 211.1008122 deg            | Operational Range: -210 deg (WEST) to +211.108122 deg (EAST) |
| Type:                   | Measured                           |                                                              |
| Supporting Information: |                                    |                                                              |
| PGN reference:          | 65267                              |                                                              |

**(R) SPN 586      Make**

Make of the component corresponding to the codes defined in the American Trucking Association Vehicle Maintenance Reporting Standard (ATA/VMRS).

Note: This parameter is to be transmitted as a 5 character ASCII string; as a zero length string, if not available. For example, International is transmitted as INTXX.

|                         |                                                      |                                       |
|-------------------------|------------------------------------------------------|---------------------------------------|
| Data Length:            | Variable - up to 5 bytes followed by an "" delimiter |                                       |
| Resolution:             | ASCII, 0 offset                                      |                                       |
| Data Range:             | 0 to 255 per byte                                    | Operational Range: same as data range |
| Type:                   | Measured                                             |                                       |
| Supporting Information: |                                                      |                                       |
| PGN reference:          | 65259                                                |                                       |

**SPN 587      Model**

Model of the component.

NOTE - The ASCII character "" is reserved as a delimiter.

|                         |                                                        |                                       |
|-------------------------|--------------------------------------------------------|---------------------------------------|
| Data Length:            | Variable - up to 200 bytes followed by an "" delimiter |                                       |
| Resolution:             | ASCII, 0 offset                                        |                                       |
| Data Range:             | 0 to 255 per byte                                      | Operational Range: same as data range |
| Type:                   | Measured                                               |                                       |
| Supporting Information: |                                                        |                                       |
| PGN reference:          | 65259                                                  |                                       |

**SPN 588      Serial Number**

Serial number of the component.

NOTE - The ASCII character "" is reserved as a delimiter.

|                         |                                                        |                                       |
|-------------------------|--------------------------------------------------------|---------------------------------------|
| Data Length:            | Variable - up to 200 bytes followed by an "" delimiter |                                       |
| Resolution:             | ASCII, 0 offset                                        |                                       |
| Data Range:             | 0 to 255 per byte                                      | Operational Range: same as data range |
| Type:                   | Measured                                               |                                       |
| Supporting Information: |                                                        |                                       |
| PGN reference:          | 65259                                                  |                                       |

**SPN 589      Alternator Speed**

Actual rotation speed of the alternator.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.5 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 32,127.5 rpm     | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65237                 |                                       |

**SPN 590                    Engine Idle Shutdown Timer State**

Status signal which indicates the current mode of operation of the idle shutdown timer system. See Figure SPN590\_A.

00 - Inactive  
01 - Active  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: | See Appendix D - SPN 590 |                                       |
| PGN reference:          | 65252                    |                                       |

**SPN 591                    Engine Idle Shutdown Timer Function**

Parameter which indicates the configuration of the idle shutdown timer system.

00 - Disabled in calibration  
01 - Enabled in calibration  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65252                    |                                       |

**SPN 592                    Engine Idle Shutdown Timer Override**

Status signal which indicates the status of the override feature of the idle shutdown timer system. See Figure SPN590\_A.

00 - Inactive  
01 - Active  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65252                    |                                       |



**SPN 593                    Engine Idle Shutdown has Shutdown Engine**

Status signal which identifies whether or not the engine has been shutdown by the idle shutdown timer system. See Figure SPN590\_A.

00 - No  
01 - Yes  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65252

Operational Range: same as data range

**SPN 594                    Engine Idle Shutdown Driver Alert Mode**

Status signal which indicates the status of the driver alert mode of the idle shutdown timer system. While the driver alert mode is active, the idle shutdown timer may be overridden. See Figure SPN590\_A.

00 - Inactive  
01 - Active  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65252

Operational Range: same as data range

**SPN 595                    Cruise Control Active**

Cruise control is switched on. It is not ensured that the engine is controlled by cruise control, as in the case of a large driver's demand the engine is controlled by the driver while cruise control is active (maximum selection of cruise control and driver's demand). The cruise control is set to 0 if a switch off condition occurs.

00 - Cruise control switched off  
01 - Cruise control switched on  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65265

Operational Range: same as data range

**SPN 596                      Cruise Control Enable Switch**

Switch signal which indicates that it is possible to manage the cruise control function.

00 - Cruise control disabled  
01 - Cruise control enabled  
10 - Error  
11 - Not available

Data Length:                2 bits  
Resolution:                4 states/2 bit, 0 offset  
Data Range:                0 to 3  
Type:                        Measured  
Supporting Information:  
PGN reference:              65265

Operational Range: same as data range

**SPN 597                      Brake Switch**

Switch signal which indicates that the driver operated brake foot pedal is being pressed. This brake foot pedal is controlling the vehicles' service brake (total vehicle braking application, not park brakes). It is necessary for safe drivetrain behavior that the switch activates before the physical braking components are activated (i.e. Disengage the cruise control function prior to the activation of friction brakes).

00 - Brake pedal released  
01 - Brake pedal depressed  
10 - Error  
11 - Not Available

Data Length:                2 bits  
Resolution:                4 states/2 bit, 0 offset  
Data Range:                0 to 3  
Type:                        Measured  
Supporting Information:  
PGN reference:              65265

Operational Range: same as data range

**SPN 598                      Clutch Switch**

Switch signal which indicates that the clutch pedal is being pressed. It is necessary for a safe drivetrain behavior that the clutch switch is set before the clutch is opened (cruise control function).

00 - Clutch pedal released  
01 - Clutch pedal depressed  
10 - Error  
11 - Not available

Data Length:                2 bits  
Resolution:                4 states/2 bit, 0 offset  
Data Range:                0 to 3  
Type:                        Measured  
Supporting Information:  
PGN reference:              65265

Operational Range: same as data range

**SPN 599                      Cruise Control Set Switch**

Switch signal of the cruise control activator which indicates that the activator is in the position "set."

- 00 - Cruise control activator not in the position "set"
- 01 - Cruise control activator in position "set"
- 10 - Error
- 11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65265                    |                                       |

**SPN 600                      Cruise Control Coast (Decelerate) Switch**

Switch signal of the cruise control activator which indicates that the activator is in the position "coast (decelerate)."

- 00 - Cruise control activator not in the position "coast"
- 01 - Cruise control activator in position "coast"
- 10 - Error
- 11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65265                    |                                       |

**SPN 601                      Cruise Control Resume Switch**

Switch signal of the cruise control activator which indicates that the activator is in the position "resume."

- 00 - Cruise control activator not in the position "resume"
- 01 - Cruise control activator in position "resume"
- 10 - Error
- 11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65265                    |                                       |

**SPN 602                      Cruise Control Accelerate Switch**

Switch signal of the cruise control activator which indicates that the activator is in the position "accelerate."

00 - Cruise control activator not in the position "accelerate"

01 - Cruise control activator in position "accelerate"

10 - Error

11 - Not available

Data Length:                2 bits

Resolution:                4 states/2 bit, 0 offset

Data Range:                0 to 3

Operational Range: same as data range

Type:                        Measured

Supporting Information:

PGN reference:            65265

**SPN 604                      Transmission Neutral Switch**

Identifies the status of the switch that indicates neutral.

00 - Off

01 - On

10 - Error

11 - Not available

Data Length:                2 bits

Resolution:                4 states/2 bit, 0 offset

Data Range:                0 to 3

Operational Range: same as data range

Type:                        Status

Supporting Information:

PGN reference:            65219

**SPN 605                      Refrigerant High Pressure Switch**

Switch signal which indicates the position of the high pressure switch in the coolant circuit of an air conditioning system. When the switch is enabled, the pressure inside the circuit is too high and the compressor clutch may be disengaged.

00 - Pressure normal

01 - Pressure too high, compressor clutch may be disengaged

10 - Error

11 - Not available

Data Length:                2 bits

Resolution:                4 states/2 bit, 0 offset

Data Range:                0 to 3

Operational Range: same as data range

Type:                        Measured

Supporting Information:

PGN reference:            65252

**SPN 606                      Engine Momentary Overspeed Enable**

Command signal used to indicate that the engine speed may be boosted up to the maximum engine overspeed value to accommodate transmission downshifts. The maximum time for overspeed is limited by the time defined in the engine

configuration message (see PGN 65,251). The transmission module must command a "override disabled" state at least once before the engine will accept a subsequent request for overspeed.

00 Momentary engine overspeed is disabled  
01 Momentary engine overspeed is enabled  
10 Reserved  
11 Take no action

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 61442

Operational Range: same as data range

### **SPN 607**                      ***Progressive Shift Disable***

Command signal used to indicate that progressive shifting by the engine should be disallowed.

00 Progressive shift is not disabled  
01 Progressive shift is disabled  
10 Reserved  
11 Take no action

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 61442

Operational Range: same as data range

### **SPN 619**                      ***Parking Brake Actuator***

Signal which indicates the current state of the actuator(s) that control the parking brake (see also SPN 70 and 5275).

00 - Parking brake actuator inactive  
01 - Parking brake actuator active  
10 - Error  
11 - Not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information: See Appendix D - SPN 5275  
PGN reference: 65274

Operational Range: same as data range

**SPN 626                    Engine Start Enable Device 1**

Devices that assist an Engine in starting, e.g. intake heaters and ether. Primary starting aid.  
Parameter indicating whether the start enable device 1 is ON or OFF

00 - start enable OFF  
01 - start enable ON  
10 - reserved  
11 - not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64966

Operational Range: same as data range

**SPN 632                    Engine Fuel Shutoff 1 Control**

Control setting for fuel shutoff 1. The second instance is SPN 2807. For a single fuel shutoff system, this represents its commanded position. For a dual fuel shutoff system, this SPN is representative of the upstream fuel shutoff commanded position. When fuel (gas) is desired at the engine, the fuel shutoff is opened. Otherwise, it is closed.

00 = Open (fuel supplied to engine)  
01 = Closed (no fuel supplied to engine)  
10 = Reserved  
11 = Don't care / take no action

In addition to communicating desired action of fuel shutoff 1 and its driver status, this new SPN can be used to communicate whether fuel shutoff 1 feedback position (if available) matches the commanded position, through the use of FMIs.

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64914

Operational Range: same as data range

**SPN 633                    Engine Fuel Actuator 1 Control Command**

The control command to fuel actuator 1, normalized to percent, where 0% represents fully closed and 100% represents fully open. Typically, this fuel actuator is used to regulate low pressure natural gas flow rate, mixing into the air flow, which together then come into the engine. Using the standard convention for determining the position. Left/front is #1 and right/rear is #2 (SPN 1244).

Data Length:            2 bytes  
Resolution:            0.0025 %/bit, 0 offset  
Data Range:            0 to 160.6375 %  
Type:                    Status  
Supporting Information:  
PGN reference:        61466

Operational Range: 0 to 100%

**SPN 641                      Engine Variable Geometry Turbocharger Actuator #1**

Actuator that controls the variable geometry turbocharger geometry. The control command to the actuator, normalized to percent, where 0% nominally represents fully closed (smallest turbocharger geometry) and 100% represents fully open (largest geometry turbocharger).

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Status              |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64931               |                                       |

**SPN 681                      Transmission Gear Shift Inhibit Request**

Command signal to inhibit gear shifts.

00 Gear shifts are allowed (disable function)  
01 Gear shifts are inhibited (enable function)  
10 Reserved  
11 Take no action (leave function as is)

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 256                      |                                       |

**SPN 682                      Transmission Torque Converter Lockup Disable Request**

Command signal to prevent torque converter lockup, which may cause problems in certain circumstances for ASR.

00 Allow torque converter lockup  
01 Disable torque converter lockup  
10 Reserved  
11 Take no action

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 256                      |                                       |

**SPN 683                      Disengage Driveline Request**

Command signal used to simply disengage the driveline, e.g., to prevent engine drag torque from causing high wheel slip on slippery surfaces.

00 Allow driveline engagement  
01 Disengage driveline  
10 Reserved  
11 Take no action

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 256                      |                                       |

**SPN 684                      Requested Percent Clutch Slip**

Parameter which represents the percent clutch slip requested by a device.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Status              |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 256                 |                                       |

**SPN 685                      Disengage Differential Lock Request - Front Axle 1**

Command signal used to disengage the various differential locks, e.g., to allow an undistributed individual wheel control by ABS. The differential locks are located as defined in Figure SPN564\_A.

00 Engage differential lock  
01 Disengage differential lock  
10 Reserved  
11 Take no action

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 256                      |                                       |

.....



**SPN 686                      Disengage Differential Lock Request - Front Axle 2**

Command signal used to disengage the various differential locks, e.g., to allow an undistributed individual wheel control by ABS. The differential locks are located as defined in Figure SPN564\_A.

00 Engage differential lock  
01 Disengage differential lock  
10 Reserved  
11 Take no action

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 256                      |                                       |

**SPN 687                      Disengage Differential Lock Request - Rear Axle 1**

Command signal used to disengage the various differential locks, e.g., to allow an undistributed individual wheel control by ABS. The differential locks are located as defined in Figure SPN564\_A.

00 Engage differential lock  
01 Disengage differential lock  
10 Reserved  
11 Take no action

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 256                      |                                       |

**SPN 688                      Disengage Differential Lock Request - Rear Axle 2**

Command signal used to disengage the various differential locks, e.g., to allow an undistributed individual wheel control by ABS. The differential locks are located as defined in Figure SPN564\_A.

00 Engage differential lock  
01 Disengage differential lock  
10 Reserved  
11 Take no action

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 256                      |                                       |

**SPN 689                    Disengage Differential Lock Request - Central**

Command signal used to disengage the various differential locks, e.g., to allow an undistributed individual wheel control by ABS. The differential locks are located as defined in Figure SPN564\_A.

00 Engage differential lock  
01 Disengage differential lock  
10 Reserved  
11 Take no action

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 256                      |                                       |

**SPN 690                    Disengage Differential Lock Request - Central Front**

Command signal used to disengage the various differential locks, e.g., to allow an undistributed individual wheel control by ABS. The differential locks are located as defined in Figure SPN564\_A.

00 Engage differential lock  
01 Disengage differential lock  
10 Reserved  
11 Take no action

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 256                      |                                       |

**SPN 691                    Disengage Differential Lock Request - Central Rear**

Command signal used to disengage the various differential locks, e.g., to allow an undistributed individual wheel control by ABS. The differential locks are located as defined in Figure SPN564\_A.

00 Engage differential lock  
01 Disengage differential lock  
10 Reserved  
11 Take no action

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 256                      |                                       |

**SPN 695      Engine Override Control Mode**

The override control mode defines which sort of command is used:

- 00 Override disabled - Disable any existing control commanded by the source of this command.
- 01 Speed control - Govern speed to the included "desired speed" value.
- 10 Torque control - Control torque to the included "desired torque" value.
- 11 Speed/torque limit control - Limit speed and/or torque based on the included limit values. The speed limit governor is a droop governor where the speed limit value defines the speed at the maximum torque available during this operation.

If a device wants to know whether it has access to the engine, there are several possibilities:

- a. Comparing its command with the actual engine broadcasts.
- b. Looking at command modes from other devices.
- c. Looking to the engine and retarder torque mode.

Remarks:

- a. The realization of a torque limit (minimum selection) is possible by setting the speed limit to a high value (0xFAFF).
- b. The realization of a speed limit (minimum selection) is possible by setting the torque limit to a high value (0xFA).
- c. Limiting the retarder torque means to limit the magnitude of the torque request. As the brake torque is represented by negative torque values, the limitation must be done by a maximum selection of the requested torque and the retarder internal torque signals.
- d. For torque increasing functions, time limits for the torque or speed value (command) and the direct modes are desirable.
- e. The selection of which device has control of the engine's speed or torque depends on the override mode priority (see SPN 897) with the highest priority device gaining control. In the case of two devices with identical priority, the engine responds to speed/torque control commands over speed/torque limit commands and will act on the speed or torque commands on a first come, first served basis. The torque limit will be a "lowest wins" selection (e.g., if one device commands 60% limit and another 80% limit, then the engine will limit torque to 60%). Figure SPN695\_A provides a flowchart of the torque/speed control priority selection logic.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: | See Appendix D - SPN 695 |                                       |
| PGN reference:          | 0                        |                                       |

**SPN 696                      Engine Requested Speed Control Conditions**

This mode tells the engine control system the governor characteristics that are desired during speed control. The four characteristics defined are:

- 00 Transient Optimized for driveline disengaged and non-lockup conditions
- 01 Stability Optimized for driveline disengaged and non-lockup conditions
- 10 Stability Optimized for driveline engaged and/or in lockup condition 1 (e.g., vehicle driveline)
- 11 Stability Optimized for driveline engaged and/or in lockup condition 2 (e.g., PTO driveline)

00b - This speed governor gain selection is adjusted to provide rapid transition between speed setpoints. RPM overshoot and undershoot may be greater than what is seen when the "speed control characteristic" is set to be stability optimized.

01b - This control condition has been optimized to minimize rpm overshoot and undershoot given an expected plant consisting of the engine and its accessory loads. This gain adjustment is not intended to compensate for driveline characteristics. This characteristic is most appropriate when no driveline is connected.

10b - This control condition has been optimized to minimize rpm overshoot and undershoot given a more complex plant. For instance, the more complex plant would contain the engine, its accessory loads and the driveline characteristics. As an example, the driveline characteristics might include the effective spring mass relationship of pumps, tires, clutches, axles, driveshafts, and multiple gear ratios. This characteristic is most appropriate when a driveline is engaged.

11b - This speed control characteristic is available for applications requiring compensation for more than one driveline characteristic. It has been optimized to minimize rpm overshoot and undershoot given a more complex plant of the second variety. This more complex plant would again contain the engine, its accessory loads and a second driveline characteristic unique from the one described in speed control characteristic 10b.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 0                        |                                       |

**SPN 701                      Auxiliary I/O #01**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error
- 11 - Not available

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 65241                      |                                       |

**SPN 702                    Auxiliary I/O #02**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

00 - Auxiliary channel off  
01 - Auxiliary channel on  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Dependent upon Application  
Supporting Information:  
PGN reference:           65241

Operational Range: same as data range

**SPN 703                    Auxiliary I/O #03**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

00 - Auxiliary channel off  
01 - Auxiliary channel on  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Dependent upon Application  
Supporting Information:  
PGN reference:           65241

Operational Range: same as data range

**SPN 704                    Auxiliary I/O #04**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

00 - Auxiliary channel off  
01 - Auxiliary channel on  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Dependent upon Application  
Supporting Information:  
PGN reference:           65241

Operational Range: same as data range

**SPN 705                    Auxiliary I/O #05**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

00 - Auxiliary channel off  
01 - Auxiliary channel on  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Dependent upon Application  
Supporting Information:  
PGN reference:           65241

Operational Range: same as data range

**SPN 706                    Auxiliary I/O #06**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

00 - Auxiliary channel off  
01 - Auxiliary channel on  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Dependent upon Application  
Supporting Information:  
PGN reference:           65241

Operational Range: same as data range

**SPN 707                    Auxiliary I/O #07**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

00 - Auxiliary channel off  
01 - Auxiliary channel on  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Dependent upon Application  
Supporting Information:  
PGN reference:           65241

Operational Range: same as data range

**SPN 708                    Auxiliary I/O #08**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

00 - Auxiliary channel off  
01 - Auxiliary channel on  
10 - Error  
11 - Not available

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 65241                      |                                       |

**SPN 709                    Auxiliary I/O #09**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

00 - Auxiliary channel off  
01 - Auxiliary channel on  
10 - Error  
11 - Not available

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 65241                      |                                       |

**SPN 710                    Auxiliary I/O #10**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

00 - Auxiliary channel off  
01 - Auxiliary channel on  
10 - Error  
11 - Not available

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 65241                      |                                       |

**SPN 711            Auxiliary I/O #11**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

00 - Auxiliary channel off  
01 - Auxiliary channel on  
10 - Error  
11 - Not available

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 65241                      |                                       |

**SPN 712            Auxiliary I/O #12**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

00 - Auxiliary channel off  
01 - Auxiliary channel on  
10 - Error  
11 - Not available

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 65241                      |                                       |

**SPN 713            Auxiliary I/O #13**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

00 - Auxiliary channel off  
01 - Auxiliary channel on  
10 - Error  
11 - Not available

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 65241                      |                                       |



**SPN 714            Auxiliary I/O #14**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

00 - Auxiliary channel off  
01 - Auxiliary channel on  
10 - Error  
11 - Not available

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 65241                      |                                       |

**SPN 715            Auxiliary I/O #15**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

00 - Auxiliary channel off  
01 - Auxiliary channel on  
10 - Error  
11 - Not available

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 65241                      |                                       |

**SPN 716            Auxiliary I/O #16**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

00 - Auxiliary channel off  
01 - Auxiliary channel on  
10 - Error  
11 - Not available

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 65241                      |                                       |

**SPN 723                      Engine Speed 2**

The engine speed as measured by speed sensor 2

Note: This is for the engine speed from the 2nd engine speed sensor. This may be different than SPN 190 when used in multiple engine speed sensor configurations. In an application with multiple engine speed sensors, SPN 190 data can be derived from any of the speed sensors.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.5 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 32,127.5 rpm     | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 61473                 |                                       |

**SPN 740                      Transmission Lockup Clutch Actuator**

Identifies the status of the actuator that controls the lockup clutch.

00 - Off  
01 - On  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65223                    |                                       |

**SPN 748                      Transmission Output Retarder**

Identifies the status of the transmission output retarder.

00 - Off  
01 - On  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65218                    |                                       |

**SPN 767                      Transmission Reverse Direction Switch**

Identifies the status of the switch that indicates reverse direction.

00 - Off  
01 - On  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65219

Operational Range: same as data range

**SPN 768                      Transmission Range High Actuator**

Identifies the status of the range high actuator in the auxiliary unit.

00 -Off  
01 -On  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65223

Operational Range: same as data range

**SPN 769                      Transmission Range Low Actuator**

Identifies the status of the range low actuator in the auxiliary unit.

00 - Off  
01 - On  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65223

Operational Range: same as data range

**SPN 770                      Transmission Splitter Direct Actuator**

Identifies the status of the splitter direct actuator in the auxiliary unit.

00 - Off  
01 - On  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65223

Operational Range: same as data range

**SPN 771                      Transmission Splitter Indirect Actuator**

Identifies the status of the splitter indirect actuator in the auxiliary unit.

00 - Off  
01 - On  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65223

Operational Range: same as data range

**SPN 772                      Transmission Shift Finger Rail Actuator 1**

Identifies the status of the actuator that moves the shift finger identified as rail actuator #1.

00 - Off  
01 - On  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65223

Operational Range: same as data range

**SPN 773                      Transmission Shift Finger Gear Actuator 1**

Identifies the status of the actuator that moves the shift finger identified as gear actuator #1.

00 - Off  
01 - On  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65223                    |                                       |

**SPN 778                      Transmission High Range Sense Switch**

Identifies the status of the switch that represents high range.

00 - Off  
01 - On  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65219                    |                                       |

**SPN 779                      Transmission Low Range Sense Switch**

Identifies the status of the switch that represents low range.

00 - Off  
01 - On  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65219                    |                                       |

**SPN 780                      Transmission Shift Finger Neutral Indicator**

Indicates the status of the shift finger in the neutral position.

00 - Off  
01 - On  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65223                    |                                       |

**SPN 781                      Transmission Shift Finger Engagement Indicator**

Identifies the status of the shift finger in the engagement position.

00 - Off  
01 - On  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65223                    |                                       |

**SPN 782                      Transmission Shift Finger Center Rail Indicator**

Identifies the status of the shift finger in the center rail position.

00 - Off  
01 - On  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65223                    |                                       |

**SPN 783                      Transmission Shift Finger Rail Actuator 2**

Identifies the status of the actuator that moves the shift finger identified as rail actuator #2.

00 - Off  
01 - On  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65223                    |                                       |

**SPN 784                      Transmission Shift Finger Gear Actuator 2**

Identifies the status of the actuator that moves the shift finger identified as gear actuator #2.

00 - Off  
01 - On  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65223                    |                                       |

**SPN 786                      Transmission Defuel Actuator**

Identifies the status of the actuator that controls the engine defuel mechanism.

00 - Off  
01 - On  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65223                    |                                       |

**SPN 787                      Transmission Inertia Brake Actuator**

Identifies the status of the actuator that controls the inertia brake.

00 - Off  
01 - On  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65223

Operational Range: same as data range

**SPN 788                      Transmission Clutch Actuator**

Identifies the status of the actuator that controls the clutch.

00 - Off  
01 - On  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65223

Operational Range: same as data range

**SPN 875                      Refrigerant Low Pressure Switch**

Switch signal which indicates the position of the low pressure switch in the coolant circuit of an air conditioning system. When the switch is enabled, the pressure inside the circuit is too low and the compressor clutch may be disengaged.

00 - Pressure normal  
01 - Pressure too low, compressor clutch may be disengaged  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65252

Operational Range: same as data range



**SPN 897                      Override Control Mode Priority**

This field is used as an input to the engine or retarder to determine the priority of the Override Control Mode received in the Torque/Speed Control message (see PGN 0). The default is 11 (Low priority). It is not required to use the same priority during the entire override function. For example, the transmission can use priority 01 (High priority) during a shift, but can set the priority to 11 (Low priority) at the end of the shift to allow traction control to also interact with the torque limit of the engine.

The four priority levels defined are:

00 Highest priority  
01 High priority  
10 Medium priority  
11 Low priority

00b - Highest Priority = Used for situations that require immediate action by the receiving device in order to provide safe vehicle operation (i.e., braking systems). This level of priority should only be used in safety critical conditions.

01b - High Priority = Used for control situations that require prompt action in order to provide safe vehicle operation. An example is when the transmission is performing a shift and requires control of the engine in order to control driveline reengagement.

10b - Medium Priority = Used for powertrain control operations which are related to assuring that the vehicle is in a stable operating condition. An example is when the traction control system is commanding the engine in order to achieve traction stability.

11b - Low Priority = Used to indicate that the associated command desires powertrain control but is needed for function which improves the driver comfort which may be overridden by other devices. An example is cruise control or the non-critical part of a transmission shift to a new gear.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 0                        |                                       |

**SPN 898                      Engine Requested Speed/Speed Limit**

Parameter provided to the engine from external sources in the torque/speed control message. This is the engine speed which the engine is expected to operate at if the speed control mode is active or the engine speed which the engine is not expected to exceed if the speed limit mode is active.

|                         |                         |                                       |
|-------------------------|-------------------------|---------------------------------------|
| Data Length:            | 2 bytes                 |                                       |
| Resolution:             | 0.125 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 8,031.875 rpm      | Operational Range: same as data range |
| Type:                   | Status                  |                                       |
| Supporting Information: |                         |                                       |
| PGN reference:          | 0                       |                                       |

**SPN 899                    Engine Torque Mode**

State signal which indicates which engine torque mode is currently generating, limiting, or controlling the torque. Note that the modes are not in prioritized order. Not all modes may be relevant for a given device. Some devices may not implement all functions. For typical priorities refer to Figures SPN512\_A and SPN512\_B for engine control. The data type of this parameter is measured.

Mode 0000b means "No request": engine torque may range from 0 to full load only due to low idle governor output.

Modes 0001b to 1110b indicate that there is either a torque request or the identified function is currently controlling the engine: engine torque may range from 0 (no fueling) to the upper limit.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: | See Appendix D - SPN 899  |                                       |
| PGN reference:          | 61444                     |                                       |

**SPN 900                    Retarder Torque Mode**

State signal which indicates which retarder torque mode is currently generating, limiting, or controlling the torque. Note that the modes are not in prioritized order. Not all modes may be relevant for a given device. Some devices may not implement all functions. For typical priorities refer to Tables SPN518\_A to SPN518\_B for retarder control. The data type of this parameter is measured.

Mode 0000b means "No request": retarder torque = 0 (no braking).

Modes 0001b to 1110b indicate that there is either a torque request or the identified function is currently controlling the retarder: retarder torque may range from 0 (no braking) to the upper limit.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: | See Appendix D - SPN 899  |                                       |
| PGN reference:          | 61440                     |                                       |

**SPN 901                      Retarder Type**

A vehicle retarder is a supplementary device to the wheel brakes for the driver to better control the vehicle. The wheel brakes used in the vehicle are not designed for continuous retarding operation. In a prolonged period of braking, the brakes can be thermally over-stressed, causing the braking effect to be reduced or even lead to complete braking system failure. The vehicle retarder is designed for continuous operation for braking during downhill operation and is also used for braking the vehicle to comply with speed limits and traffic conditions.

This parameter provides some indication of the retarder dynamics. It is used in the retarder configuration message. The data type of this parameter is measured.

|           |                                       |
|-----------|---------------------------------------|
| 0000      | Electric/Magnetic                     |
| 0001      | Hydraulic                             |
| 0010      | Cooled Friction                       |
| 0011      | Compression Release (Engine retarder) |
| 0100      | Exhaust                               |
| 0101-1101 | Not defined                           |
| 1110      | Other                                 |
| 1111      | Not available                         |

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: | See Appendix D - SPN 901  |                                       |
| PGN reference:          | 65249                     |                                       |

**SPN 902                      Retarder Location**

This parameter defines whether the "torque/speed curve" defined by the retarder configuration message (PGN 65249) is dependent on engine rpm, output shaft rpm, or other parameter. The data type of this parameter is measured.

|           |             |                                               |
|-----------|-------------|-----------------------------------------------|
| 0000      | (Primary)   | Engine Compression Release Brake (Engine rpm) |
| 0001      | (Primary)   | Engine Exhaust Brake (Exhaust pressure)       |
| 0010      | (Primary)   | Transmission Input (Engine rpm)               |
| 0011      | (Secondary) | Transmission Output (Output Shaft rpm)        |
| 0100      | (Secondary) | Driveline (Output Shaft rpm)                  |
| 0101      |             | Trailer (Vehicle speed)                       |
| 0110-1101 |             | Not defined                                   |
| 1110      |             | Other                                         |
| 1111      |             | Not available                                 |

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 65249                     |                                       |

**SPN 903                      Transmission Forward Direction Switch**

Identifies the status of the switch that indicates forward direction.

00 - Off  
01 - On  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65219                    |                                       |

**SPN 904                      Front Axle Speed**

The average speed of the two front wheels.

|                         |                              |                                       |
|-------------------------|------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                      |                                       |
| Resolution:             | 1/256 km/h per bit, 0 offset |                                       |
| Data Range:             | 0 to 250.996 km/h            | Operational Range: same as data range |
| Type:                   | Measured                     |                                       |
| Supporting Information: |                              |                                       |
| PGN reference:          | 65215                        |                                       |

**SPN 905                      Relative Speed; Front Axle, Left Wheel**

The speed of the front axle, left wheel relative to the front axle speed, SPN 904.

|                         |                                        |                                       |
|-------------------------|----------------------------------------|---------------------------------------|
| Data Length:            | 1 byte                                 |                                       |
| Resolution:             | 1/16 km/h per bit, -7.8125 km/h offset |                                       |
| Data Range:             | -7.8125 to 7.8125 km/h                 | Operational Range: same as data range |
| Type:                   | Measured                               |                                       |
| Supporting Information: |                                        |                                       |
| PGN reference:          | 65215                                  |                                       |

**SPN 906                      Relative Speed; Front Axle, Right Wheel**

The speed of the front axle, right wheel relative to the front axle speed, SPN 904.

|                         |                                        |                                       |
|-------------------------|----------------------------------------|---------------------------------------|
| Data Length:            | 1 byte                                 |                                       |
| Resolution:             | 1/16 km/h per bit, -7.8125 km/h offset |                                       |
| Data Range:             | -7.8125 to 7.8125 km/h                 | Operational Range: same as data range |
| Type:                   | Measured                               |                                       |
| Supporting Information: |                                        |                                       |
| PGN reference:          | 65215                                  |                                       |

**SPN 907                      Relative Speed; Rear Axle #1, Left Wheel**

The speed of the rear axle #1, left wheel relative to the front axle speed, SPN 904.

Data Length:                1 byte  
Resolution:                1/16 km/h per bit, -7.8125 km/h offset  
Data Range:                -7.8125 to 7.8125 km/h                      Operational Range: same as data range  
Type:                        Measured  
Supporting Information:  
PGN reference:              65215

**SPN 908                      Relative Speed; Rear Axle #1, Right Wheel**

The speed of the rear axle #1, right wheel relative to the front axle speed, SPN 904.

Data Length:                1 byte  
Resolution:                1/16 km/h per bit, -7.8125 km/h offset  
Data Range:                -7.8125 to 7.8125 km/h                      Operational Range: same as data range  
Type:                        Measured  
Supporting Information:  
PGN reference:              65215

**SPN 909                      Relative Speed; Rear Axle #2, Left Wheel**

The speed of the rear axle #2, left wheel relative to the front axle speed, SPN 904.

Data Length:                1 byte  
Resolution:                1/16 km/h per bit, -7.8125 km/h offset  
Data Range:                -7.8125 to 7.8125 km/h                      Operational Range: same as data range  
Type:                        Measured  
Supporting Information:  
PGN reference:              65215

**SPN 910                      Relative Speed; Rear Axle #2, Right Wheel**

The speed of the rear axle #2, right wheel relative to the front axle speed, SPN 904.

Data Length:                1 byte  
Resolution:                1/16 km/h per bit, -7.8125 km/h offset  
Data Range:                -7.8125 to 7.8125 km/h                      Operational Range: same as data range  
Type:                        Measured  
Supporting Information:  
PGN reference:              65215

**SPN 911                      Service Component Identification**

Identification of component needing service. See Table SPN911\_A.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 1 byte                   |                                       |
| Resolution:             | 1 ID/bit, 0 offset       |                                       |
| Data Range:             | 0 to 250 ID              | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: | See Appendix D - SPN 911 |                                       |
| PGN reference:          | 65216                    |                                       |

**SPN 912                      Service Component Identification**

Identification of component needing service. See Table SPN911\_A.

|                         |                    |                                       |
|-------------------------|--------------------|---------------------------------------|
| Data Length:            | 1 byte             |                                       |
| Resolution:             | 1 ID/bit, 0 offset |                                       |
| Data Range:             | 0 to 250 ID        | Operational Range: same as data range |
| Type:                   | Measured           |                                       |
| Supporting Information: |                    |                                       |
| PGN reference:          | 65216              |                                       |

**SPN 913                      Service Component Identification**

Identification of component needing service. See Table SPN911\_A.

|                         |                    |                                       |
|-------------------------|--------------------|---------------------------------------|
| Data Length:            | 1 byte             |                                       |
| Resolution:             | 1 ID/bit, 0 offset |                                       |
| Data Range:             | 0 to 250 ID        | Operational Range: same as data range |
| Type:                   | Measured           |                                       |
| Supporting Information: |                    |                                       |
| PGN reference:          | 65216              |                                       |

**SPN 914                      Service Distance**

The distance which can be traveled by the vehicle before the next service inspection is required. A negative distance is transmitted if the service inspection has been passed. The component that requires service is identified by the service component identification (see SPN 911-913, 1379, and 1584).

|                         |                              |                                       |
|-------------------------|------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                      |                                       |
| Resolution:             | 5 km/bit, -160,635 km offset |                                       |
| Data Range:             | -160,635 to 160,640 km       | Operational Range: same as data range |
| Type:                   | Measured                     |                                       |
| Supporting Information: |                              |                                       |
| PGN reference:          | 65216                        |                                       |

**SPN 915                      Service Delay/Calendar Time Based**

The time in weeks until the next vehicle service inspection is required. A negative value is transmitted if the service inspection has been passed. The component that requires service is identified by the service component identification (see SPN 911-913, 1379, and 1584).

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 week/bit, -125 weeks offset |                                       |
| Data Range:             | -125 to 125 weeks             | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          | 65216                         |                                       |

**SPN 916                      Service Delay/Operational Time Based**

The time in vehicle operational time until the next vehicle service inspection is required. A negative value is transmitted if the service inspection has been passed. The component that requires service is identified by the service component identification (see SPN 911-913, 1379, and 1584).

|                         |                             |                                       |
|-------------------------|-----------------------------|---------------------------------------|
| Data Length:            | 2 bytes                     |                                       |
| Resolution:             | 1 hr/bit, -32,127 hr offset |                                       |
| Data Range:             | -32,127 to 32,128 hr        | Operational Range: same as data range |
| Type:                   | Measured                    |                                       |
| Supporting Information: |                             |                                       |
| PGN reference:          | 65216                       |                                       |

**SPN 917                      High Resolution Total Vehicle Distance**

Accumulated distance traveled by the vehicle during its operation.

NOTE - See SPN 245 for alternate resolution.

|                         |                    |                                       |
|-------------------------|--------------------|---------------------------------------|
| Data Length:            | 4 bytes            |                                       |
| Resolution:             | 5 m/bit, 0 offset  |                                       |
| Data Range:             | 0 to 21,055,406 km | Operational Range: same as data range |
| Type:                   | Measured           |                                       |
| Supporting Information: |                    |                                       |
| PGN reference:          | 65217              |                                       |

**SPN 918                      High Resolution Trip Distance**

Distance traveled during all or part of a journey.

NOTE - See SPN 244 for alternate resolution.

|                         |                    |                                       |
|-------------------------|--------------------|---------------------------------------|
| Data Length:            | 4 bytes            |                                       |
| Resolution:             | 5 m/bit, 0 offset  |                                       |
| Data Range:             | 0 to 21,055,406 km | Operational Range: same as data range |
| Type:                   | Measured           |                                       |
| Supporting Information: |                    |                                       |
| PGN reference:          | 65217              |                                       |

**SPN 927                      Location**

To identify to which of several similar devices (such as tires or fuel tanks) the information applies.

The low order 4 bits represent a position number, counting left to right when facing in the direction of normal vehicle travel (forward).

The high order 4 bits represent a position number, counting front to back on the vehicle.

The value 0xFF indicates not available.

It is recommended that output devices add 1 to the position number (range 1 to 15, not 0 to 14) for use by drivers and service technicians.

Examples: Tire pressure for location 0x00 would be left front tire.

Tire pressure for location 0x23 would be right outside rear rear on a 3-axle tractor with dual axle per side (3rd axle, 4th tire).

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 8 bits                     |                                       |
| Resolution:             | 256 states/8 bit, 0 offset |                                       |
| Data Range:             | 0 to 255                   | Operational Range: same as data range |
| Type:                   | Measured                   |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 61446                      |                                       |

**SPN 928                      Axle Location**

To identify to which of several similar devices (such as tires or fuel tanks) the information applies.

The low order 4 bits represent a position number, counting left to right when facing in the direction of normal vehicle travel (forward).

The high order 4 bits represent a position number, counting front to back on the vehicle.

The value 0xFF indicates not available.

It is recommended that output devices add 1 to the position number (range 1 to 15, not 0 to 14) for use by drivers and service technicians.

Examples: Tire pressure for location 0x00 would be left front tire.

Tire pressure for location 0x23 would be right outside rear rear on a 3-axle tractor with dual axle per side (3rd axle, 4th tire).

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 8 bits                     |                                       |
| Resolution:             | 256 states/8 bit, 0 offset |                                       |
| Data Range:             | 0 to 255                   | Operational Range: same as data range |
| Type:                   | Measured                   |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 65258                      |                                       |



**SPN 929      *Tire Location***

Identifies which tire is associated with the parametric data in this PGN.

The low order 4 bits represent a position number, counting left to right when facing in the direction of normal vehicle travel (forward).

The high order 4 bits represent a position number, counting front to back on the vehicle.

The value 0xFF indicates not available.

It is recommended that output devices add 1 to the position number (range 1 to 15, not 0 to 14) for use by drivers and service technicians.

Examples: Tire pressure for location 0x00 would be left front tire.

Tire pressure for location 0x23 would be right outside rear rear on a 3-axle tractor with dual axle per side (3rd axle, 4th tire).

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 8 bits                     |                                       |
| Resolution:             | 256 states/8 bit, 0 offset |                                       |
| Data Range:             | 0 to 255                   | Operational Range: same as data range |
| Type:                   | Measured                   |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 65268                      |                                       |

**SPN 930      *Drive Axle Location***

To identify to which of several similar devices (such as tires or fuel tanks) the information applies.

The low order 4 bits represent a position number, counting left to right when facing in the direction of normal vehicle travel (forward).

The high order 4 bits represent a position number, counting front to back on the vehicle.

The value 0xFF indicates not available.

It is recommended that output devices add 1 to the position number (range 1 to 15, not 0 to 14) for use by drivers and service technicians.

Examples: Tire pressure for location 0x00 would be left front tire.

Tire pressure for location 0x23 would be right outside rear rear on a 3-axle tractor with dual axle per side (3rd axle, 4th tire).

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 8 bits                     |                                       |
| Resolution:             | 256 states/8 bit, 0 offset |                                       |
| Data Range:             | 0 to 255                   | Operational Range: same as data range |
| Type:                   | Measured                   |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 65273                      |                                       |

**SPN 957                      Number of Forward Gear Ratios**

Number of forward gear ratios in the transmission, provided as part of the configuration.

|                         |                            |                                         |
|-------------------------|----------------------------|-----------------------------------------|
| Data Length:            | 1 byte                     |                                         |
| Resolution:             | 1 gear value/bit, 0 offset |                                         |
| Data Range:             | 0 to 250                   | Operational Range: 0 to 125 gear ratios |
| Type:                   | Measured                   |                                         |
| Supporting Information: |                            |                                         |
| PGN reference:          | 65250                      |                                         |

**SPN 958                      Number of Reverse Gear Ratios**

Number of reverse gear ratios in the transmission, provided as part of the transmission configuration.

|                         |                            |                                         |
|-------------------------|----------------------------|-----------------------------------------|
| Data Length:            | 1 byte                     |                                         |
| Resolution:             | 1 gear value/bit, 0 offset |                                         |
| Data Range:             | 0 to 250                   | Operational Range: 0 to 125 gear ratios |
| Type:                   | Measured                   |                                         |
| Supporting Information: |                            |                                         |
| PGN reference:          | 65250                      |                                         |

**SPN 959                      Seconds**

The seconds component of the current time of day. This should be reported as the seconds component of the current time at UTC (Universal Time Coordinate), a.k.a. GMT; however, it may be reported as the seconds component of the current time at a local time zone. The Local Hour Offset parameter (SPN 1602) is used to indicate if the time of day (SPNs 959, 960, and 961) is the current UTC time or a local time zone time. Refer to SPN 1602 for details.

|                         |                            |                                   |
|-------------------------|----------------------------|-----------------------------------|
| Data Length:            | 1 byte                     |                                   |
| Resolution:             | 0.25 s/bit, 0 offset       |                                   |
| Data Range:             | 0 to 62.5 s                | Operational Range: 0 to 59.75 sec |
| Type:                   | Measured                   |                                   |
| Supporting Information: | See Appendix D - PGN 65254 |                                   |
| PGN reference:          | 65254                      |                                   |

**SPN 960                      Minutes**

The minutes component of the current time of day. This should be reported as the minutes component of the current time at UTC (Universal Time Coordinate), a.k.a. GMT; however, it may be reported as the minutes component of the current time at a local time zone. The Local Hour Offset parameter (SPN 1602) is used to indicate if the time of day (SPNs 959, 960, and 961) is the current UTC time or a local time zone time. Refer to SPN 1602 for details.

|                         |                            |                                |
|-------------------------|----------------------------|--------------------------------|
| Data Length:            | 1 byte                     |                                |
| Resolution:             | 1 min/bit, 0 offset        |                                |
| Data Range:             | 0 to 250 mins              | Operational Range: 0 to 59 min |
| Type:                   | Measured                   |                                |
| Supporting Information: | See Appendix D - PGN 65254 |                                |
| PGN reference:          | 65254                      |                                |

**SPN 961                      Hours**

The hour component of the current time of day. This should be reported as the hour component of the current time at UTC (Universal Time Coordinate), a.k.a. GMT; however, it may be reported as the hour component of the current time at a local time zone. The Local Hour Offset parameter (SPN 1602) is used to indicate if time of day (SPNs 959, 960, and 961) is the current UTC time or a local time zone time. Refer to SPN 1602 for details.

|                         |                            |                               |
|-------------------------|----------------------------|-------------------------------|
| Data Length:            | 1 byte                     |                               |
| Resolution:             | 1 hr/bit, 0 offset         |                               |
| Data Range:             | 0 to 250 hr                | Operational Range: 0 to 23 hr |
| Type:                   | Measured                   |                               |
| Supporting Information: | See Appendix D - PGN 65254 |                               |
| PGN reference:          | 65254                      |                               |

**SPN 962                      Day**

The day component of the current calendar date. This should be reported as the day component of the current date at UTC (Universal Time Coordinate), a.k.a. GMT; however, it may be reported as the day component of the current date at a local time zone. The Local Hour Offset parameter (SPN 1602) is used to indicate if the calendar date (SPNs 962, 963, and 964) is the current UTC date or a local time zone date. Refer to SPN 1602 for details.

NOTE - A value of 0 for the date is null. The values 1, 2, 3, and 4 are used to identify the first day of the month; 5, 6, 7, and 8 identify the second day of the month; etc.

|                         |                            |                                      |
|-------------------------|----------------------------|--------------------------------------|
| Data Length:            | 1 byte                     |                                      |
| Resolution:             | 0.25 days/bit, 0 offset    |                                      |
| Data Range:             | 0 to 62.5 days             | Operational Range: 0.25 to 31.75 day |
| Type:                   | Measured                   |                                      |
| Supporting Information: | See Appendix D - PGN 65254 |                                      |
| PGN reference:          | 65254                      |                                      |

**SPN 963                      Month**

The month component of the current calendar date. This should be reported as the month component of the current date at UTC (Universal Time Coordinate), a.k.a. GMT; however, it may be reported as the month component of the current date at a local time zone. The Local Hour Offset parameter (SPN 1602) is used to indicate if the calendar date (SPNs 962, 963, and 964) is the current UTC date or a local time zone date. Refer to SPN 1602 for details.

NOTE - A value of 0 for the month is null. The value 1 identifies January; 2 identifies February; etc.

|                         |                            |                                  |
|-------------------------|----------------------------|----------------------------------|
| Data Length:            | 1 byte                     |                                  |
| Resolution:             | 1 month/bit, 0 offset      |                                  |
| Data Range:             | 0 to 250 months            | Operational Range: 1 to 12 month |
| Type:                   | Measured                   |                                  |
| Supporting Information: | See Appendix D - PGN 65254 |                                  |
| PGN reference:          | 65254                      |                                  |

**SPN 964                      Year**

The year component of the current calendar date. This should be reported as the year component of the current date at UTC (Universal Time Coordinate), a.k.a. GMT; however, it may be reported as the year component of the current date at a local time zone. The Local Hour Offset parameter (SPN 1602) is used to indicate if the calendar date (SPNs 962, 963, and 964) is the current UTC date or a local time zone date. Refer to SPN 1602 for details.

NOTE - A value of 0 for the year identifies the year 1985; a value of 1 identifies 1986; etc.

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 year/bit, 1985 years offset |                                       |
| Data Range:             | 1985 to 2235 years            | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: | See Appendix D - PGN 65254    |                                       |
| PGN reference:          | 65254                         |                                       |

**SPN 965                      Number of Software Identification Fields**

Number of software identification designators represented in the software identification parameter group.

|                         |                      |                             |
|-------------------------|----------------------|-----------------------------|
| Data Length:            | 1 byte               |                             |
| Resolution:             | 1 step/bit, 0 offset |                             |
| Data Range:             | 0 to 250 steps       | Operational Range: 0 to 125 |
| Type:                   | Measured             |                             |
| Supporting Information: |                      |                             |
| PGN reference:          | 65242                |                             |

**SPN 966                      Engine Test Mode Switch**

Switch signal which indicates the position of the engine test mode switch.

00 - Off  
01 - On  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65265                    |                                       |

**SPN 967                    Engine Idle Decrement Switch**

Switch signal which indicates the position of the idle decrement switch.

00 - Off  
01 - On  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65265

Operational Range: same as data range

**SPN 968                    Engine Idle Increment Switch**

Switch signal which indicates the position of the idle increment switch.

00 - Off  
01 - On  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65265

Operational Range: same as data range

**SPN 969                    Remote Accelerator Enable Switch**

Switch signal which indicates that the remote accelerator has been enabled and controls the engine.

00 - Off  
01 - On  
10 - Error  
11 - Not available

NOTE—The accelerator interlock switch (see SPN 972) must be disabled in order for the remote accelerator to perform engine control.

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        61441

Operational Range: same as data range

**SPN 970                    Engine Auxiliary Shutdown Switch**

Switch signal which requests that all engine fueling stop.

00 - Off  
01 - On  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        61441

Operational Range: same as data range

**SPN 971                    Engine Derate Switch**

Switch signal used to activate the torque limiting feature of the engine. The specific nature of torque limiting should be verified with the manufacturer.

00 - Off  
01 - On  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        61441

Operational Range: same as data range

**SPN 972                    Accelerator Interlock Switch**

Switch signal used to disable the accelerator and remote accelerator inputs, causing the engine to return to idle.

00 - Off  
01 - On  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        61441

Operational Range: same as data range

**SPN 973                      Engine Retarder Selection**

The position of the operator controlled selector, expressed as a percentage and determined by the ratio of the current position of the selector to its maximum possible position. Zero percent means no braking torque is requested by the operator from the engine while 100% means maximum braking.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 61441               |                                       |

**SPN 974                      Remote Accelerator Pedal Position**

The ratio of actual position of the remote analog engine speed/torque request input device (such as an accelerator pedal or throttle lever) to the maximum position of the input device.

For example, in on-highway vehicles this could be an accelerator control device that is external to the drivers cab or an accelerator that is controlled by a hand lever from the operators seat.

The Remote Accelerator Enable Switch is SPN 969. This parameter enables the remote accelerator operation.

NOTE—See SPNs 29 and 91 for additional accelerator position parameters. If only one accelerator position exists on a vehicle, SPN 91 shall be used. SPN 28 is an additional diagnostic SPN for accelerator position.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 61443               |                                       |

**SPN 975                      Estimated Percent Fan Speed**

Estimated fan speed as a ratio of the fan drive (current speed) to the fully engaged fan drive (maximum fan speed). A two state fan (off/on) will use 0% and 100% respectively. A three state fan (off/intermediate/on) will use 0%, 50% and 100% respectively. A variable speed fan will use 0% to 100%. Multiple fan systems will use 0 to 100% to indicate the percent cooling capacity being provided.

Note that the intermediate fan speed of a three state fan will vary with different fan drives, therefore 50% is being used to indicate that the intermediate speed is required from the fan drive.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Status              |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65213               |                                       |

**SPN 976*****PTO Governor State***

This parameter is used to indicate the current state or mode of operation by the power takeoff (PTO) governor. In lieu of support for PTO Drive Engagement parameters, this parameter may represent the status of a PTO drive. The broadcasting device must ensure that each achieved state is conveyed in at least one message broadcast before a transition to another state is allowed.

|             |                           |
|-------------|---------------------------|
| 00000       | Off/Disabled              |
| 00001       | Hold                      |
| 00010       | Remote Hold               |
| 00011       | Standby                   |
| 00100       | Remote Standby            |
| 00101       | Set                       |
| 00110       | Decelerate/Coast          |
| 00111       | Resume                    |
| 01000       | Accelerate                |
| 01001       | Accelerator Override      |
| 01010       | Preprogrammed set speed 1 |
| 01011       | Preprogrammed set speed 2 |
| 01100       | Preprogrammed set speed 3 |
| 01101       | Preprogrammed set speed 4 |
| 01110       | Preprogrammed set speed 5 |
| 01111       | Preprogrammed set speed 6 |
| 10000       | Preprogrammed set speed 7 |
| 10001       | Preprogrammed set speed 8 |
| 10010       | PTO set speed memory 1    |
| 10011       | PTO set speed memory 2    |
| 10100-11110 | Not defined               |
| 11111       | Not available             |

Off/Disabled 00000b — Used to indicate that the PTO governor enable switch is in the off position.

Hold 00001b — Used to indicate that the PTO governor is active and currently maintaining a captured operating speed.

Remote Hold 00010b — Used to indicate that the remote PTO governor is active and the PTO governor is currently maintaining a captured operating speed.

Standby 00011b — Used to indicate that the PTO governor device enable switch is in the ON position and it is possible to manage the PTO governor.

Remote Standby 00100b — Used to indicate that the remote PTO governor device enable switch is in the ON position and it is possible to manage the PTO governor.

Set 00101b — Used to indicate that the PTO governor is establishing current speed as the operating speed (captured value).

Decelerate/Coast 00110b — Used to indicate that the PTO governor is in the process of ramping down, or coasting, from the current operating speed.

Resume 00111b — Used to indicate that the PTO governor is in the process of resuming the operating speed to a previously captured value.

Accelerate 01000b — Used to indicate that the PTO governor is in the process of ramping up the operating speed.

Accelerator Override 01001b—Used to indicate that the PTO governor is active but for the present time the engine is controlled by a large driver's demand.



Preprogrammed PTO Governor Set Speed 1 01010b—Used to indicate that the PTO device is establishing a first preprogrammed PTO governor set speed (user programmable) as the current operating speed.

Preprogrammed PTO Governor Set Speed 2 01011b—Used to indicate that the PTO device is establishing a second preprogrammed PTO governor set speed (user programmable) as the current operating speed.

Preprogrammed PTO Governor Set Speed 3 01100b —Used to indicate that the remote PTO device is establishing a third preprogrammed PTO governor set speed (user programmable) as the current operating speed.

Preprogrammed PTO Governor Set Speed 4 01101b —Used to indicate that the remote PTO device is establishing a fourth preprogrammed PTO governor set speed (user programmable) as the current operating speed.

Preprogrammed PTO Governor Set Speed 5 01110b —Used to indicate that the remote PTO device is establishing a fifth preprogrammed PTO governor set speed (user programmable) as the current operating speed.

Preprogrammed PTO Governor Set Speed 6 01111b—Used to indicate that the remote PTO device is establishing a sixth preprogrammed PTO governor set speed (user programmable) as the current operating speed.

Preprogrammed PTO Governor Set Speed 7 10000b —Used to indicate that the remote PTO device is establishing a seventh preprogrammed PTO governor set speed (user programmable) as the current operating speed.

Preprogrammed PTO Governor Set Speed 8 10001b —Used to indicate that the remote PTO device is establishing a eighth preprogrammed PTO governor set speed (user programmable) as the current operating speed.

PTO set speed memory 1 10010b —Used to indicate that PTO set speed memory one set state is active.

PTO set speed memory 2 10011b — Used to indicate that PTO set speed memory two set state is active.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 5 bits                    |                                       |
| Resolution:             | 32 states/5 bit, 0 offset |                                       |
| Data Range:             | 0 to 31                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 65265                     |                                       |

**(R) SPN 977      Fan Drive State**

This parameter is used to indicate the current state or mode of operation by the fan drive.

0000 Fan off  
0001 Engine system—General  
0010 Excessive engine air temperature  
0011 Excessive engine oil temperature  
0100 Excessive engine coolant temperature  
0101 Excessive transmission oil temperature  
0110 Excessive hydraulic oil temperature  
0111 Default Operation  
1000 Reverse Operation  
1001 Manual control  
1010 Transmission retarder  
1011 A/C system  
1100 Timer  
1101 Engine brake  
1110 Other  
1111 Not available

Fan off 0000b —Used to indicate that the fan clutch is disengaged and the fan is inactive

Engine system—General 0001b —Used to indicate that the fan is active due to an engine system not otherwise defined.

Excessive engine air temperature 0010b —Used to indicate that the fan is active due to high air temperature.

Excessive engine oil temperature 0011b —Used to indicate that the fan is active due to high oil temperature.

Excessive engine coolant temperature 0100b —Used to indicate that the fan is active due to high coolant temperature.

Reverse Operation 1000b — Used to indicate that the fan is in reverse direction of operation compared to the normal direction of operation

Manual control 1001b —Used to indicate that the fan is active as requested by the operator.

Transmission retarder 1010b —Used to indicate that the fan is active as required by the transmission retarder.

A/C system 1011b —Used to indicate that the fan is active as required by the air conditioning system.

Timer 1100b —Used to indicate that the fan is active as required by a timing function.

Engine brake 1101b —Used to indicate that the fan is active as required to assist engine braking.

Excessive transmission oil temperature - 0101b - Used to indicate fan is active due to excessive transmission oil temperature.

Excessive hydraulic oil temperature - 0110b - Used to indicate fan is active due to excessive hydraulic oil temperature.

Default Operation - 0111b - Used to indicate fan is active due to a error condition resulting in default operation

Data Length: 4 bits  
Resolution: 16 states/4 bit, 0 offset  
Data Range: 0 to 15  
Type: Status  
Supporting Information:  
PGN reference: 65213

Operational Range: same as data range

**SPN 978                    Engine Remote PTO Governor Variable Speed Control Switch**

Switch signal which indicates that the remote PTO governor toggle switch is in the enabled (ON) position. If the toggle switch is enabled and other conditions are satisfied then the remote PTO governor feature is activated and the PTO governor will control at a variable speed.

00 - Off  
01 - On  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65264                    |                                       |

**SPN 979                    Engine Remote PTO Governor Preprogrammed Speed Control Switch**

Switch signal which indicates that the remote PTO governor toggle switch is in the enabled (ON) position. If the toggle switch is enabled and other conditions are satisfied then the remote PTO governor feature is activated and the PTO governor will control at the preprogrammed speed.

00 - Off  
01 - On  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65264                    |                                       |

**SPN 980                    Engine PTO Governor Enable Switch**

Switch signal which indicates that the PTO governor toggle switch is in the enabled (ON) position and therefore it is possible to manage the PTO control function.

00 - Off  
01 - On  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65264                    |                                       |

**SPN 981                    Engine PTO Governor Accelerate Switch**

Switch signal of the PTO control activator which indicates that the activator is in the position to "accelerate" the PTO governor set speed.

00 - Off  
01 - On  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65264

Operational Range: same as data range

**SPN 982                    Engine PTO Governor Resume Switch**

Switch signal of the PTO control activator which indicates that the activator is in the position to "resume" a previously established PTO governor set speed.

00 - Off  
01 - On  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65264

Operational Range: same as data range

**SPN 983                    Engine PTO Governor Coast/Decelerate Switch**

Switch signal of the PTO control activator which indicates that the activator is in the position to "coast/decelerate" the PTO governor set speed.

00 - Off  
01 - On  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65264

Operational Range: same as data range

**SPN 984                    Engine PTO Governor Set Switch**

Switch signal of the PTO control activator which indicates that the activator is in the position to "set" the engine PTO governor set speed.

00 - Off  
01 - On  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65264

Operational Range: same as data range

**SPN 985                    A/C High Pressure Fan Switch**

Switch signal which indicates that the pressure in the coolant circuit of an air conditioning system is high and the fan may be engaged.

00 - Pressure normal  
01 - Pressure high, fan may be engaged  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65252

Operational Range: same as data range

**SPN 986                    Requested Percent Fan Speed**

Fan speed as a ratio of the actual fan drive (current speed) to the fully engaged fan drive (maximum fan speed). A two state fan (off/on) will use 0% and 100% respectively. A three state fan (off/intermediate/on) will use 0%, 50% and 100% respectively. A variable speed fan will use 0% to 100%. Multiple fan systems will use 0 to 100% to indicate the percent cooling capacity being provided. Feedback to this request is provided using the estimated fan speed (see SPN 975).

Note that the intermediate fan speed of a three state fan will vary with different fan drives, therefore 50% is being used to indicate that the intermediate speed is required from the fan drive.

Data Length:            1 byte  
Resolution:            0.4 %/bit, 0 offset  
Data Range:            0 to 100 %  
Type:                    Status  
Supporting Information:  
PGN reference:        57344

Operational Range: same as data range

**SPN 988**      ***Trip Group 1***

Command signal used to reset the PGNs and parameters as defined in Table SPN988\_A.

00 Take no action  
01 Reset  
10 Reserved  
11 Not applicable

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: | See Appendix D - SPN 988 |                                       |
| PGN reference:          | 56832                    |                                       |

**SPN 989**      ***Trip Group 2 - Proprietary***

Command signal used to reset proprietary parameters associated with a trip but not defined within this document.

00 Take no action  
01 Reset  
10 Reserved  
11 Not applicable

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 56832                    |                                       |

**SPN 990**      ***Total Compression Brake Distance***

Total distance over which the compression brakes have been active for the life of the engine.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.125 km/bit, 0 offset |                                       |
| Data Range:             | 0 to 526,385,151.9 km  | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65212                  |                                       |

**SPN 991**      ***Trip Compression Brake Distance***

Total distance over which the compression brakes have been active since the last trip reset.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.125 km/bit, 0 offset |                                       |
| Data Range:             | 0 to 526,385,151.9 km  | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65212                  |                                       |

**SPN 992                      Trip Service Brake Distance**

Total distance over which the service brakes have been active since the last trip reset.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.125 km/bit, 0 offset |                                       |
| Data Range:             | 0 to 526,385,151.9 km  | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65212                  |                                       |

**SPN 993                      Trip Service Brake Applications**

Total number of times the service brakes have been activated since the last trip reset. Brake applications of less than 0.5 s are not counted and lengthy brake applications (longer than 0.5 s) are counted as a single event.

NOTE - Definition and resolution shall stay the same if brakes are applied by only the tractor, only the trailer or both.

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 4 bytes                    |                                       |
| Resolution:             | 1 brake appl/bit, 0 offset |                                       |
| Data Range:             | 0 to 4,227,858,431 appl    | Operational Range: same as data range |
| Type:                   | Measured                   |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 65212                      |                                       |

**SPN 994                      Trip Fan On Time**

Total time the fan has been on (due to an automatic trigger or manual trigger) since the last trip reset. The fan could be requested to be on by the engine system, a manual switch, and/or the A/C system. Whichever system requests the fan activation first shall have the time accumulated against it. The sum total of these three values shall equal the trip fan on time.

NOTE—If the fan has been requested to be on by a component that is not one of the defined categories, this time shall be accumulated in the Engine System category by default.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.05 hr/bit, 0 offset  |                                       |
| Data Range:             | 0 to 210,554,060.75 hr | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65211                  |                                       |

**SPN 995      Trip Fan On Time Due to the Engine System**

Total time the fan has been on due to engine triggers (i.e., excluding time on due to an operator manual switch or A/C system) since the last trip reset. For the time to be accumulated against the engine system, it is necessary that it be the first to request the fan activation or it be the only system requesting fan activation.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.05 hr/bit, 0 offset  |                                       |
| Data Range:             | 0 to 210,554,060.75 hr | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65211                  |                                       |

**SPN 996      Trip Fan On Time Due to a Manual Switch**

Total time the fan has been on due to manual activation by the operator (i.e., excluding time on due to automatic triggers) since the last trip reset. For the time to be accumulated against the manual switch, it is necessary that it be the first to request the fan activation or it be the only system requesting fan activation.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.05 hr/bit, 0 offset  |                                       |
| Data Range:             | 0 to 210,554,060.75 hr | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65211                  |                                       |

**SPN 997      Trip Fan On Time Due to the A/C System**

Total time the fan has been on due to the A/C system since the last trip reset. For the time to be accumulated against the A/C system, it is necessary that it be the first to request the fan activation or it be the only system requesting fan activation.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.05 hr/bit, 0 offset  |                                       |
| Data Range:             | 0 to 210,554,060.75 hr | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65211                  |                                       |

**SPN 998      Trip Distance on VSL**

Total distance accumulated while the engine torque mode is road speed governing since the last trip reset.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.125 km/bit, 0 offset |                                       |
| Data Range:             | 0 to 526,385,151.9 km  | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65210                  |                                       |



**SPN 999                      Trip Gear Down Distance**

Total distance accumulated while the vehicle has operated in the gear which is one gear down from top gear and exceeds a calibrated minimum time (typically the time to shift the transmission) since the last trip reset.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.125 km/bit, 0 offset |                                       |
| Data Range:             | 0 to 526,385,151.9 km  | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65210                  |                                       |

**SPN 1000                      Trip Distance in Top Gear**

Total distance accumulated while the vehicle has operated in top gear for a calibrated minimum time since the last trip reset.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.125 km/bit, 0 offset |                                       |
| Data Range:             | 0 to 526,385,151.9 km  | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65210                  |                                       |

**SPN 1001                      Trip Drive Fuel Used**

Total fuel consumed while the engine speed is greater than zero, vehicle speed is greater than or equal to 2 km/h, and neither the PTO or the remote PTO is controlling the engine power output, since the last trip reset.

NOTE—This parameter is intended for liquid fueled engines. See SPN 1007 for alternate resolution.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.5 L/bit, 0 offset    |                                       |
| Data Range:             | 0 to 2,105,540,607.5 L | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65209                  |                                       |

**SPN 1002                      Trip PTO Governor Moving Fuel Used**

Total fuel consumed while either the PTO or remote PTO governors are in the hold state, the engine speed is greater than zero, and vehicle speed is greater than or equal to 2 km/h, since the last trip reset.

NOTE—This parameter is intended for liquid fueled engines. See SPN 1008 for alternate resolution.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.5 L/bit, 0 offset    |                                       |
| Data Range:             | 0 to 2,105,540,607.5 L | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65209                  |                                       |

**SPN 1003**      ***Trip PTO Governor Non-moving Fuel Used***

Total fuel consumed while either the PTO or remote PTO governors are in the hold state, the engine speed is greater than zero, and vehicle speed is less than 2 km/h, since the last trip reset.

NOTE—This parameter is intended for liquid fueled engines. See SPN 1009 for alternate resolution.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.5 L/bit, 0 offset    |                                       |
| Data Range:             | 0 to 2,105,540,607.5 L | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65209                  |                                       |

**SPN 1004**      ***Trip Vehicle Idle Fuel Used***

Total fuel consumed while neither the PTO or remote PTO governor is in the hold state, the engine speed is greater than zero, and vehicle speed is less than 2 km/h, since the last trip reset.

In marine applications, this parameter is defined as the total fuel consumed while the engine speed is greater than zero, and less than or equal to 50 RPM greater than low idle, since the last trip reset.

NOTE—This parameter is intended for liquid fueled engines. See SPN 1010 for alternate resolution.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.5 L/bit, 0 offset    |                                       |
| Data Range:             | 0 to 2,105,540,607.5 L | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65209                  |                                       |

**SPN 1005**      ***Trip Cruise Fuel Used***

Total fuel consumed while the engine is in the cruise hold state since the last trip reset. If both cruise control and VSL (vehicle speed limiter) are commanding the same amount of fuel, the cruise control is deemed the active torque mode and fuel will be accumulated in "trip cruise fuel used" parameter. If fuel commanded due to the accelerator pedal position is larger than fuel commanded by cruise control (e.g., accelerator override torque mode), the cruise control is not deemed the active torque mode and fuel will not be accumulated in the "trip cruise fuel used" parameter.

NOTE—This parameter is intended for liquid fueled engines. See SPN 1011 for alternate resolution.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.5 L/bit, 0 offset    |                                       |
| Data Range:             | 0 to 2,105,540,607.5 L | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65209                  |                                       |

**SPN 1006**      ***Trip Drive Fuel Economy***

Trip drive fuel economy is equal to the distance traveled by vehicle in the drive state (engine speed greater than zero, vehicle speed greater than or equal to 2 km/h, and neither the PTO or remote PTO governors are controlling engine power output) divided by trip drive fuel used (SPN 1001), since the last trip reset.

NOTE—This parameter is intended for liquid fueled engines. See SPN 1012 for alternate resolution.

|                         |                              |                                       |
|-------------------------|------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                      |                                       |
| Resolution:             | 1/512 km/L per bit, 0 offset |                                       |
| Data Range:             | 0 to 125.5 km/L              | Operational Range: same as data range |
| Type:                   | Measured                     |                                       |
| Supporting Information: |                              |                                       |
| PGN reference:          | 65209                        |                                       |

**SPN 1007**      ***Trip Drive Fuel Used (Gaseous)***

Total fuel consumed while the engine speed is greater than zero, vehicle speed is greater than or equal to 2 km/h, and neither the PTO or the remote PTO governors are controlling the engine power output, since the last trip reset.

NOTE—This parameter is intended for gaseous fueled engines. See SPN 1001 for alternate resolution.

|                         |                         |                                       |
|-------------------------|-------------------------|---------------------------------------|
| Data Length:            | 4 bytes                 |                                       |
| Resolution:             | 0.5 kg/bit, 0 offset    |                                       |
| Data Range:             | 0 to 2,105,540,607.5 kg | Operational Range: same as data range |
| Type:                   | Measured                |                                       |
| Supporting Information: |                         |                                       |
| PGN reference:          | 65208                   |                                       |

**SPN 1008**      ***Trip PTO Governor Moving Fuel Used (Gaseous)***

Total fuel consumed while the PTO or remote PTO governors are in the hold state, the engine speed is greater than zero, and vehicle speed is greater than or equal to 2 km/h, since the last trip reset.

NOTE—This parameter is intended for gaseous fueled engines. See SPN 1002 for alternate resolution.

|                         |                         |                                       |
|-------------------------|-------------------------|---------------------------------------|
| Data Length:            | 4 bytes                 |                                       |
| Resolution:             | 0.5 kg/bit, 0 offset    |                                       |
| Data Range:             | 0 to 2,105,540,607.5 kg | Operational Range: same as data range |
| Type:                   | Measured                |                                       |
| Supporting Information: |                         |                                       |
| PGN reference:          | 65208                   |                                       |

**SPN 1009**      ***Trip PTO Governor Non-moving Fuel Used (Gaseous)***

Total fuel consumed while the PTO or remote PTO governors are in the hold state, the engine speed is greater than zero, and vehicle speed is less than to 2 km/h, since the last trip reset.

NOTE—This parameter is intended for gaseous fueled engines. See SPN 1003 for alternate resolution.

|                         |                         |                                       |
|-------------------------|-------------------------|---------------------------------------|
| Data Length:            | 4 bytes                 |                                       |
| Resolution:             | 0.5 kg/bit, 0 offset    |                                       |
| Data Range:             | 0 to 2,105,540,607.5 kg | Operational Range: same as data range |
| Type:                   | Measured                |                                       |
| Supporting Information: |                         |                                       |
| PGN reference:          | 65208                   |                                       |

**SPN 1010**      ***Trip Vehicle Idle Fuel Used (Gaseous)***

Total fuel consumed while neither the PTO or remote PTO governors are active, the engine speed is greater than zero, and vehicle speed is less than to 2 km/h, since the last trip reset.

NOTE—This parameter is intended for gaseous fueled engines. See SPN 1004 for alternate resolution. Trip vehicle idle fuel while in fast idle (vehicle speed less than 2 km/h with engine speed greater than 700 rpm) shall be accumulated in the trip vehicle idle fuel category. All other fuel usage scenarios that do not fall directly in the categories defined shall be accumulated in trip drive fuel used.

|                         |                         |                                       |
|-------------------------|-------------------------|---------------------------------------|
| Data Length:            | 4 bytes                 |                                       |
| Resolution:             | 0.5 kg/bit, 0 offset    |                                       |
| Data Range:             | 0 to 2,105,540,607.5 kg | Operational Range: same as data range |
| Type:                   | Measured                |                                       |
| Supporting Information: |                         |                                       |
| PGN reference:          | 65208                   |                                       |

**SPN 1011**      ***Trip Cruise Fuel Used (Gaseous)***

Total fuel consumed while the engine is in the cruise hold state since the last trip reset. If both cruise control and VSL (vehicle speed limiter) are commanding the same amount of fuel, the cruise control is deemed the active torque mode and fuel will be accumulated in "trip cruise fuel used" parameter. If fuel commanded due to the accelerator pedal position is larger than fuel commanded by cruise control (e.g., accelerator override torque mode), the cruise control is not deemed the active torque mode and fuel will not be accumulated in the "trip cruise fuel used" parameter.

NOTE—This parameter is intended for gaseous fueled engines. See SPN 1005 for alternate resolution.

|                         |                         |                                       |
|-------------------------|-------------------------|---------------------------------------|
| Data Length:            | 4 bytes                 |                                       |
| Resolution:             | 0.5 kg/bit, 0 offset    |                                       |
| Data Range:             | 0 to 2,105,540,607.5 kg | Operational Range: same as data range |
| Type:                   | Measured                |                                       |
| Supporting Information: |                         |                                       |
| PGN reference:          | 65208                   |                                       |

**SPN 1012      Trip Drive Fuel Economy (Gaseous)**

Trip drive fuel economy is equal to the distance traveled by vehicle in the drive state (engine speed greater than zero, vehicle speed greater than or equal to 2 km/h, and neither the PTO or remote PTO governors are controlling engine power output) divided by trip drive fuel used (SPN 1007), since the last trip reset.

NOTE—This parameter is intended for gaseous fueled engines. See SPN 1006 for alternate resolution.

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                       |                                       |
| Resolution:             | 1/512 km/kg per bit, 0 offset |                                       |
| Data Range:             | 0 to 125.5 km/kg              | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          | 65208                         |                                       |

**SPN 1013      Trip Maximum Engine Speed**

Maximum engine speed achieved since the last trip reset.

|                         |                         |                                       |
|-------------------------|-------------------------|---------------------------------------|
| Data Length:            | 2 bytes                 |                                       |
| Resolution:             | 0.125 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 8,031.875 rpm      | Operational Range: same as data range |
| Type:                   | Measured                |                                       |
| Supporting Information: |                         |                                       |
| PGN reference:          | 65207                   |                                       |

**SPN 1014      Trip Average Engine Speed**

Average speed of the engine since the last trip reset.

NOTE — Excludes ignition-on time without the engine speed above zero. Includes idle, engine PTO governor (moving and non-moving), and drive operation.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 2 bytes                   |                                       |
| Resolution:             | 0.125 rpm/bit, 0 offset   |                                       |
| Data Range:             | 0 to 8,031.875 rpm        | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: | See Appendix D - SPN 1014 |                                       |
| PGN reference:          | 65207                     |                                       |

**SPN 1015      Trip Drive Average Load Factor**

Average engine load factor while engine speed is greater than zero, vehicle speed is greater than or equal to 2 km/h, and both the PTO (moving/non-moving) and remote PTO governors are not in the hold state, since the last trip reset. Engine operation during cruise control operation is included.

In marine applications, this parameter is defined as the average engine load factor while engine speed is greater than zero, since last trip reset.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65207               |                                       |

**SPN 1016      Total Drive Average Load Factor**

Average engine load factor while engine speed is greater than zero, vehicle speed is greater than or equal to 2 km/h, and both the PTO (moving/non-moving) and remote PTO governors are not in the hold state, over the life of the engine. Engine operation during cruise control operation is included.

In marine applications, this parameter is defined as the average engine load factor while engine speed is greater than zero.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65207               |                                       |

**SPN 1017      Total Engine Cruise Time**

Total time that the engine has operated in the cruise hold state, excluding time in accelerator override, over the life of the engine.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.05 hr/bit, 0 offset  |                                       |
| Data Range:             | 0 to 210,554,060.75 hr | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65207                  |                                       |

**SPN 1018**      ***Trip Maximum Vehicle Speed***

Maximum vehicle speed achieved while the engine speed is greater than zero and the accelerator pedal position (APS) is at a value greater than 0%, since the last trip reset.

|                         |                              |                                       |
|-------------------------|------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                      |                                       |
| Resolution:             | 1/256 km/h per bit, 0 offset |                                       |
| Data Range:             | 0 to 250.996 km/h            | Operational Range: same as data range |
| Type:                   | Measured                     |                                       |
| Supporting Information: |                              |                                       |
| PGN reference:          | 65206                        |                                       |

**SPN 1019**      ***Trip Cruise Distance***

Total distance that the engine has operated in the cruise hold state, excluding time in accelerator override, since the last trip reset.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.125 km/bit, 0 offset |                                       |
| Data Range:             | 0 to 526,385,151.9 km  | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65206                  |                                       |

**SPN 1020**      ***Trip Number of Hot Shutdowns***

Total number of hot shutdowns since the last trip reset. A hot shutdown is based on operation at high load or high engine speed or for long operating periods without allowing the engine to cool sufficiently.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 1 count/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 counts    | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65205                 |                                       |

**SPN 1021**      ***Trip Number of Idle Shutdowns***

Total number of times the engine has been shutdown due to idling too long (at normal idle or fast idle) since the last trip reset.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 1 count/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 counts    | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65205                 |                                       |

**SPN 1022**      ***Trip Number of Idle Shutdown Overrides***

Total number of times an operator disables idle shutdown to prevent an engine shutdown, since the last trip reset.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 1 count/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 counts    | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65205                 |                                       |

**SPN 1023**      ***Trip Sudden Decelerations***

Total number of decelerations whenever the vehicle deceleration is more than XYZ km/h/sec (where XYZ is a calibratable threshold), since the last trip reset. A lengthy deceleration shall be counted as one sudden deceleration.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 1 count/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 counts    | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65205                 |                                       |

**SPN 1024**      ***Trip Time in VSL***

Total time accumulated when the engine has operated on the vehicle speed limiter (VSL) while not in the cruise hold state, since the last trip reset. The engine torque mode is equal to road speed governor during this operation.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.05 hr/bit, 0 offset  |                                       |
| Data Range:             | 0 to 210,554,060.75 hr | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65204                  |                                       |

**SPN 1025**      ***Trip Time in Top Gear***

Total time accumulated when the vehicle has operated in top gear for a calibrated minimum time, since the last trip reset.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.05 hr/bit, 0 offset  |                                       |
| Data Range:             | 0 to 210,554,060.75 hr | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65204                  |                                       |



**SPN 1026**      ***Trip Time in Gear Down***

Total time accumulated when the vehicle has operated in one gear down from the top gear for a calibrated minimum time, since the last trip reset.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.05 hr/bit, 0 offset  |                                       |
| Data Range:             | 0 to 210,554,060.75 hr | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65204                  |                                       |

**SPN 1027**      ***Trip Time in Derate by Engine***

Total time accumulated when the engine final fueling has been derated due to an engine protection algorithm, since the last reset.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.05 hr/bit, 0 offset  |                                       |
| Data Range:             | 0 to 210,554,060.75 hr | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65204                  |                                       |

**SPN 1028**      ***Total Engine PTO Governor Fuel Used***

Total fuel used while the PTO or remote PTO governors are in the hold state and engine speed is above zero, over the life of the engine.

NOTE—This parameter is intended for liquid fueled engines. See SPN 1030 for alternate resolution.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.5 L/bit, 0 offset    |                                       |
| Data Range:             | 0 to 2,105,540,607.5 L | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65203                  |                                       |

**SPN 1029**      ***Trip Average Fuel Rate***

Average fuel rate, equal to trip fuel divided by trip time while the engine speed is above zero, since the last trip reset. This includes idle, engine PTO governor (both moving and non-moving) and drive operation but excludes ignition-on time while the engine speed is at zero rpm.

NOTE—This parameter is intended for liquid fueled engines. See SPN 1031 for alternate resolution.

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bytes                    |                                       |
| Resolution:             | 0.05 L/h per bit, 0 offset |                                       |
| Data Range:             | 0 to 3,212.75 L/h          | Operational Range: same as data range |
| Type:                   | Measured                   |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 65203                      |                                       |

**SPN 1030      Total Engine PTO Governor Fuel Used (Gaseous)**

Total fuel used while the PTO or remote PTO governors are in the hold state and engine speed is above zero, over the life of the engine.

NOTE—This parameter is intended for gaseous fueled engines. See SPN 1028 for alternate resolution.

|                         |                         |                                       |
|-------------------------|-------------------------|---------------------------------------|
| Data Length:            | 4 bytes                 |                                       |
| Resolution:             | 0.5 kg/bit, 0 offset    |                                       |
| Data Range:             | 0 to 2,105,540,607.5 kg | Operational Range: same as data range |
| Type:                   | Measured                |                                       |
| Supporting Information: |                         |                                       |
| PGN reference:          | 65202                   |                                       |

**SPN 1031      Trip Average Fuel Rate (Gaseous)**

Average fuel rate, equal to trip fuel divided by trip time while the engine speed is above zero, since the last trip reset. This includes idle, engine PTO governor (both moving and non-moving) and drive operation but excludes ignition-on time while the engine speed is at zero rpm.

NOTE—This parameter is intended for gaseous fueled engines. See SPN 1029 for alternate resolution.

|                         |                             |                                       |
|-------------------------|-----------------------------|---------------------------------------|
| Data Length:            | 2 bytes                     |                                       |
| Resolution:             | 0.05 kg/h per bit, 0 offset |                                       |
| Data Range:             | 0 to 3212.75 kg/h           | Operational Range: same as data range |
| Type:                   | Measured                    |                                       |
| Supporting Information: |                             |                                       |
| PGN reference:          | 65202                       |                                       |

**SPN 1032      Total ECU Distance**

Total distance accumulated over the life of the ECU. When the ECU is replaced this value shall be reset.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.125 km/bit, 0 offset |                                       |
| Data Range:             | 0 to 526,385,151.9 km  | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65201                  |                                       |

**SPN 1033      Total ECU Run Time**

Total time accumulated over the life of the ECU, from ignition switch ON to ignition switch OFF. When the ECU is replaced this value shall be reset.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.05 hr/bit, 0 offset  |                                       |
| Data Range:             | 0 to 210,554,060.75 hr | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65201                  |                                       |

**SPN 1034      Trip Cruise Time**

Total time accumulated while the engine is in the cruise hold state, excluding time in accelerator override, since the last trip reset.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.05 hr/bit, 0 offset  |                                       |
| Data Range:             | 0 to 210,554,060.75 hr | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65200                  |                                       |

**SPN 1035      Trip PTO Governor Time**

Total time accumulated while the engine is in the PTO or remote PTO governor hold state since the last trip reset.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.05 hr/bit, 0 offset  |                                       |
| Data Range:             | 0 to 210,554,060.75 hr | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65200                  |                                       |

**SPN 1036      Trip Engine Running Time**

Total time accumulated while the engine speed is greater than zero since the last trip reset. Note that time with the ignition switch on but engine speed at zero is not included.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.05 hr/bit, 0 offset  |                                       |
| Data Range:             | 0 to 210,554,060.75 hr | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65200                  |                                       |

**SPN 1037      Trip Idle Time**

Total time accumulated while the engine speed is greater than zero, both the PTO and remote PTO governors are inactive, and the vehicle speed is less than 2 km/h, since the last trip reset.

In marine applications, this parameter is defined as the total time accumulated while the engine speed is greater than zero, and less than or equal to 50 RPM greater than low idle, since the last trip reset.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.05 hr/bit, 0 offset  |                                       |
| Data Range:             | 0 to 210,554,060.75 hr | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65200                  |                                       |

**SPN 1038      Trip Air Compressor On Time**

Total time that the air compressor is on and compressing air since the last trip reset.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.05 hr/bit, 0 offset  |                                       |
| Data Range:             | 0 to 210,554,060.75 hr | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65200                  |                                       |

**SPN 1039      Trip Fuel (Gaseous)**

Total fuel consumed (trip drive fuel + trip PTO governor moving fuel + trip PTO governor non-moving fuel + trip idle fuel) since the last trip reset.

|                         |                         |                                       |
|-------------------------|-------------------------|---------------------------------------|
| Data Length:            | 4 bytes                 |                                       |
| Resolution:             | 0.5 kg/bit, 0 offset    |                                       |
| Data Range:             | 0 to 2,105,540,607.5 kg | Operational Range: same as data range |
| Type:                   | Measured                |                                       |
| Supporting Information: |                         |                                       |
| PGN reference:          | 65199                   |                                       |

**SPN 1040      Total Fuel Used (Gaseous)**

Total fuel consumed (trip drive fuel + trip PTO governor moving fuel + trip PTO governor non-moving fuel + trip idle fuel) over the life of the engine.

|                         |                         |                                       |
|-------------------------|-------------------------|---------------------------------------|
| Data Length:            | 4 bytes                 |                                       |
| Resolution:             | 0.5 kg/bit, 0 offset    |                                       |
| Data Range:             | 0 to 2,105,540,607.5 kg | Operational Range: same as data range |
| Type:                   | Measured                |                                       |
| Supporting Information: |                         |                                       |
| PGN reference:          | 65199                   |                                       |

**(R) SPN 1081      Engine Wait to Start Lamp**

Lamp signal which indicates that the engine is too cold to start and the operator should wait until the signal becomes inactive (turns off). See SPN 5416 for the lamp operating condition.

00 - Off  
01 - On  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65252                    |                                       |

**SPN 1082      Engine Coolant Load Increase**

Status of an event, external to the engine, that may increase the nominal temperature of the engine coolant liquid.

00 - No coolant load increase  
01 - Coolant load increase possible  
10 - Error  
11 - Not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 61440

Operational Range: same as data range

**SPN 1083      Auxiliary I/O Channel #1**

Auxiliary channel of data (16 bit) read by the ECU. This data is in A/D counts and is manufacturer specific. It may be configured uniquely per application.

Data Length: 2 bytes  
Resolution: 1 count/bit, 0 offset  
Data Range: 0 to 64,255 counts  
Type: Measured  
Supporting Information:  
PGN reference: 65241

Operational Range: same as data range

**SPN 1084      Auxiliary I/O Channel #2**

Auxiliary channel of data (16 bit) read by the ECU. This data is in A/D counts and is manufacturer specific. It may be configured uniquely per application.

Data Length: 2 bytes  
Resolution: 1 count/bit, 0 offset  
Data Range: 0 to 64,255 counts  
Type: Measured  
Supporting Information:  
PGN reference: 65241

Operational Range: same as data range

**SPN 1085      Intended Retarder Percent Torque**

Braking torque of retarder that the retarder is currently trying to achieve. This value takes into account all static limitations, but not the limitations due to the dynamic behavior of the retarder. This value, if unchanged over a certain time, can and will be reached by the actual retarder - percent torque (See SPN 520).

Data Length: 1 byte  
Resolution: 1 %/bit, -125 % offset  
Data Range: -125 to 125 %  
Type: Status  
Supporting Information: See Appendix D - SPN 1085  
PGN reference: 61440

Operational Range: -125 to 0%

**SPN 1086      *Parking and/or Trailer Air Pressure***

The pneumatic pressure in the circuit or reservoir for the parking brake and/or the trailer supply.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 8 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 2,000 kPa      | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65198               |                                       |

**SPN 1087      *Service Brake Circuit 1 Air Pressure***

The pneumatic pressure in the primary service brake circuit or reservoir, supplying the rear axle.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 8 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 2,000 kPa      | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65198               |                                       |

**SPN 1088      *Service Brake Circuit 2 Air Pressure***

The pneumatic pressure in the secondary service brake circuit or reservoir, supplying the front axle.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 8 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 2,000 kPa      | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65198               |                                       |

**SPN 1089      *Auxiliary Equipment Supply Pressure***

The pneumatic pressure in the auxiliary circuit.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 8 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 2,000 kPa      | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65198               |                                       |

**SPN 1090      *Air Suspension Supply Pressure***

The pneumatic pressure in the circuit for the electronically controlled air suspension system.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 8 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 2,000 kPa      | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65198               |                                       |

**SPN 1091      *Brake Application Pressure High Range, Front Axle, Left Wheel***

The brake application pressure for the left wheel on the front axle.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 5 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 1,250 kPa      | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65197               |                                       |

**SPN 1092      *Brake Application Pressure High Range, Front Axle, Right Wheel***

The brake application pressure for the right wheel on the front axle.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 5 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 1,250 kPa      | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65197               |                                       |

**SPN 1093      *Brake Application Pressure High Range, Rear Axle #1, Left Wheel***

The brake application pressure for the left wheel on the rear axle #1.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 5 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 1,250 kPa      | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65197               |                                       |

**SPN 1094      Brake Application Pressure High Range, Rear Axle #1, Right Wheel**

The brake application pressure for the right wheel on the rear axle #1.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 5 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 1,250 kPa      | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65197               |                                       |

**SPN 1095      Brake Application Pressure High Range, Rear Axle #2, Left Wheel**

The brake application pressure for the left wheel on the rear axle #2.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 5 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 1,250 kPa      | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65197               |                                       |

**SPN 1096      Brake Application Pressure High Range, Rear Axle #2, Right Wheel**

The brake application pressure for the right wheel on the rear axle #2.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 5 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 1,250 kPa      | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65197               |                                       |

**SPN 1097      Brake Application Pressure High Range, Rear Axle #3, Left Wheel**

The brake application pressure for the left wheel on the rear axle #3.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 5 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 1,250 kPa      | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65197               |                                       |



**SPN 1098      Brake Application Pressure High Range, Rear Axle #3, Right Wheel**

The brake application pressure for the right wheel on the rear axle #3.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 5 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 1,250 kPa      | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65197               |                                       |

**SPN 1099      Brake Lining Remaining, Front Axle, Left Wheel**

The percentage of brake lining which can still be measured for the left wheel on the front axle. 100% represents new brake linings, 0% represents totally worn brake linings.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65196               |                                       |

**SPN 1100      Brake Lining Remaining, Front Axle, Right Wheel**

The percentage of brake lining which can still be measured for the right wheel on the front axle. 100% represents new brake linings, 0% represents totally worn brake linings.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65196               |                                       |

**SPN 1101      Brake Lining Remaining, Rear Axle #1, Left Wheel**

The percentage of brake lining which can still be measured for the left wheel on the rear axle #1. 100% represents new brake linings, 0% represents totally worn brake linings.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65196               |                                       |

**SPN 1102      Brake Lining Remaining, Rear Axle #1, Right Wheel**

The percentage of brake lining which can still be measured for the right wheel on the rear axle #1. 100% represents new brake linings, 0% represents totally worn brake linings.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65196               |                                       |

**SPN 1103      Brake Lining Remaining, Rear Axle #2, Left Wheel**

The percentage of brake lining which can still be measured for the left wheel on the rear axle #2. 100% represents new brake linings, 0% represents totally worn brake linings.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65196               |                                       |

**SPN 1104      Brake Lining Remaining, Rear Axle #2, Right Wheel**

The percentage of brake lining which can still be measured for the right wheel on the rear axle #2. 100% represents new brake linings, 0% represents totally worn brake linings.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65196               |                                       |

**SPN 1105      Brake Lining Remaining, Rear Axle #3, Left Wheel**

The percentage of brake lining which can still be measured for the left wheel on the rear axle #3. 100% represents new brake linings, 0% represents totally worn brake linings.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65196               |                                       |

**SPN 1106      Brake Lining Remaining, Rear Axle #3, Right Wheel**

The percentage of brake lining which can still be measured for the right wheel on the rear axle #3. 100% represents new brake linings, 0% represents totally worn brake linings.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65196               |                                       |

**SPN 1107      Engine Protection System Timer State**

Status signal which indicates the current mode of the engine protection system timer system. See Figure SPN1107\_A.

00 - Inactive  
01 - Active  
10 - Error  
11 - Not available

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 2 bits                    |                                       |
| Resolution:             | 4 states/2 bit, 0 offset  |                                       |
| Data Range:             | 0 to 3                    | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: | See Appendix D - SPN 1107 |                                       |
| PGN reference:          | 65252                     |                                       |

**SPN 1108      Engine Protection System Timer Override**

Status signal which indicates the status of the override feature of the engine protection system timer. See Figure SPN1107\_A.

00 - Inactive  
01 - Active  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65252                    |                                       |

**SPN 1109      Engine Protection System Approaching Shutdown**

Status signal which indicates that engine shutdown is imminent. This engine protection signal can be a result of different systems failing, i.e., engine overheating. See Figure SPN1107\_A.

00 - Not approaching  
01 - Approaching  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65252                    |                                       |

**SPN 1110      Engine Protection System has Shutdown Engine**

Status signal which indicates whether or not the engine protection system has shutdown the engine. See Figure SPN1107\_A.

00 - No  
01 - Yes  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65252                    |                                       |

**SPN 1111      Engine Protection System Configuration**

Parameter which indicates the configuration of the engine shutdown system.

00 - Disabled in calibration  
01 - Enabled in calibration  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65252                    |                                       |

**SPN 1113      *Recommended Gear***

The transmission calculates this gear continuously. In dangerous situations this gear may be selected to gain back vehicle control.

Data Length: 1 byte  
Resolution: 1 gear value/bit, -125 offset  
Data Range: -125 to 125

Operational Range: -125 to +125, negative values are reverse gears, positive values are forward gears, zero is neutral. 251 (0xFB) is park.

Type: Status  
Supporting Information:  
PGN reference: 65195

**SPN 1114      *Lowest Possible Gear***

The transmission calculates this gear continuously. Together with the highest possible gear (see SPN 1115), it enables a management computer to know the exact range of available gears.

Data Length: 1 byte  
Resolution: 1 gear value/bit, -125 offset  
Data Range: -125 to 125

Operational Range: -125 to +125, negative values are reverse gears, positive values are forward gears, zero is neutral. 251 (0xFB) is park.

Type: Status  
Supporting Information:  
PGN reference: 65195

**SPN 1115      *Highest Possible Gear***

The transmission calculates this gear continuously. Together with the lowest possible gear (see SPN 1114), it enables a management computer to know the exact range of available gears.

Data Length: 1 byte  
Resolution: 1 gear value/bit, -125 offset  
Data Range: -125 to 125

Operational Range: -125 to +125, negative values are reverse gears, positive values are forward gears, zero is neutral. 251 (0xFB) is park.

Type: Status  
Supporting Information:  
PGN reference: 65195

**SPN 1116      Engine Gaseous Fuel Correction Factor**

A correction to a predefined gaseous fuel energy (expressed in energy per unit volume) represented as a percentage. The actual fuel energy used to control the engine is the product of the gaseous fuel correction factor and the energy of the gas.

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 1 byte            |                                       |
| Resolution:             | 1 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 250 %        | Operational Range: same as data range |
| Type:                   | Measured          |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 65194             |                                       |

**SPN 1117      Engine Desired Rated Exhaust Oxygen**

The desired amount of oxygen in the exhaust at rated conditions represented as a percentage by volume with respect to the total volume of exhaust gases leaving the engine.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 2 bytes                |                                       |
| Resolution:             | 0.0025 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 160.6375 %        | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65193                  |                                       |

**SPN 1118      Engine Desired Exhaust Oxygen**

The desired amount of oxygen in the exhaust represented as a percentage by volume with respect to the total volume of exhaust gases leaving the engine.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 2 bytes                |                                       |
| Resolution:             | 0.0025 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 160.6375 %        | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65193                  |                                       |

**SPN 1119      Engine Actual Exhaust Oxygen**

The actual amount of oxygen in the exhaust represented as a percentage by volume with respect to the total volume of exhaust gases leaving the engine.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 2 bytes                |                                       |
| Resolution:             | 0.0025 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 160.6375 %        | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65193                  |                                       |

**SPN 1120      Articulation Angle**

Angle of deflection of an articulated transit vehicle. A right turn is indicated with a positive angle and a left turn is indicated with a negative angle.

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 1 byte                     |                                       |
| Resolution:             | 1 deg/bit, -125 deg offset |                                       |
| Data Range:             | -125 to 125 deg            | Operational Range: same as data range |
| Type:                   | Measured                   |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 65192                      |                                       |

**SPN 1121      EBS Brake Switch**

Switch signal which indicates that the brake pedal is being pressed. The EBS brake switch is independent of the brake light switch and has no provisions for external connections.

00 - Brake pedal is not being pressed  
01 - Brake pedal is being pressed  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61441                    |                                       |

**SPN 1122      Engine Alternator Bearing 1 Temperature**

Temperature of the bearing inside the alternator. Bearing 1 is the left or rear bearing.

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 deg C/bit, -40 deg C offset |                                       |
| Data Range:             | -40 to 210 deg C              | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          | 65191                         |                                       |

**SPN 1123      Engine Alternator Bearing 2 Temperature**

Temperature of the bearing inside the alternator. Bearing 2 is the right or front bearing.

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 deg C/bit, -40 deg C offset |                                       |
| Data Range:             | -40 to 210 deg C              | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          | 65191                         |                                       |

**SPN 1124      Engine Alternator Winding 1 Temperature**

Temperature of the windings inside the alternator.

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 deg C/bit, -40 deg C offset |                                       |
| Data Range:             | -40 to 210 deg C              | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          | 65191                         |                                       |

**SPN 1125      Engine Alternator Winding 2 Temperature**

Temperature of the windings inside the alternator.

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 deg C/bit, -40 deg C offset |                                       |
| Data Range:             | -40 to 210 deg C              | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          | 65191                         |                                       |

**SPN 1126      Engine Alternator Winding 3 Temperature**

Temperature of the windings inside the alternator.

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 deg C/bit, -40 deg C offset |                                       |
| Data Range:             | -40 to 210 deg C              | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          | 65191                         |                                       |

**SPN 1127      Engine Turbocharger 1 Boost Pressure**

Gage pressure of air measured downstream of the compressor discharge side of the turbocharger. See also SPN 102 for alternate range and resolution. If there is only one boost pressure to report and the range and resolution in SPN 102 is adequate, then it should be used.

|                         |                                       |                                       |
|-------------------------|---------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                               |                                       |
| Resolution:             | 0.125 kPa/bit, 0 offset               |                                       |
| Data Range:             | 0 to +8031.875 kPa (0 to 1164.62 psi) | Operational Range: same as data range |
| Type:                   | Measured                              |                                       |
| Supporting Information: |                                       |                                       |
| PGN reference:          | 65190                                 |                                       |



**SPN 1128      Engine Turbocharger 2 Boost Pressure**

Gage pressure of air measured downstream of the compressor discharge side of the turbocharger. See also SPN 102 for alternate range and resolution. If there is only one boost pressure to report and the range and resolution in SPN 102 is adequate, then it should be used.

Data Length: 2 bytes  
Resolution: 0.125 kPa/bit, 0 offset  
Data Range: 0 to +8031.875 kPa (0 to 1164.62 psi) Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65190

**SPN 1129      Engine Turbocharger 3 Boost Pressure**

Gage pressure of air measured downstream of the compressor discharge side of the turbocharger. See also SPN 102 for alternate range and resolution. If there is only one boost pressure to report and the range and resolution in SPN 102 is adequate, then it should be used.

Data Length: 2 bytes  
Resolution: 0.125 kPa/bit, 0 offset  
Data Range: 0 to +8031.875 kPa (0 to 1164.62 psi) Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65190

**SPN 1130      Engine Turbocharger 4 Boost Pressure**

Gage pressure of air measured downstream of the compressor discharge side of the turbocharger. See also SPN 102 for alternate range and resolution. If there is only one boost pressure to report and the range and resolution in SPN 102 is adequate, then it should be used.

Data Length: 2 bytes  
Resolution: 0.125 kPa/bit, 0 offset  
Data Range: 0 to +8031.875 kPa (0 to 1164.62 psi) Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65190

**SPN 1131      Engine Intake Manifold 2 Temperature**

Temperature of pre-combustion air found in intake manifold of engine air supply system.

Data Length: 1 byte  
Resolution: 1 deg C/bit, -40 deg C offset  
Data Range: -40 to 210 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65189

**SPN 1132      Engine Intake Manifold 3 Temperature**

Temperature of pre-combustion air found in intake manifold of engine air supply system.

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 deg C/bit, -40 deg C offset |                                       |
| Data Range:             | -40 to 210 deg C              | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          | 65189                         |                                       |

**SPN 1133      Engine Intake Manifold 4 Temperature**

Temperature of pre-combustion air found in intake manifold of engine air supply system.

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 deg C/bit, -40 deg C offset |                                       |
| Data Range:             | -40 to 210 deg C              | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          | 65189                         |                                       |

**SPN 1134      Engine Intercooler Thermostat Opening**

The current position of the thermostat used to regulate the temperature of the engine intercooler. A value of 0% represents the thermostat being completely closed and 100% represents the thermostat being completely open.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65262               |                                       |

**SPN 1135      Engine Oil Temperature 2**

Temperature of the engine lubricant.

|                         |                                      |                                       |
|-------------------------|--------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                              |                                       |
| Resolution:             | 0.03125 deg C/bit, -273 deg C offset |                                       |
| Data Range:             | -273 to 1734.96875 deg C             | Operational Range: same as data range |
| Type:                   | Measured                             |                                       |
| Supporting Information: |                                      |                                       |
| PGN reference:          | 65188                                |                                       |

**SPN 1136      Engine ECU Temperature**

Temperature of the engine electronic control unit.

Data Length:            2 bytes  
Resolution:            0.03125 deg C/bit, -273 deg C offset  
Data Range:            -273 to 1734.96875 deg C      Operational Range: same as data range  
Type:                    Measured  
Supporting Information:  
PGN reference:        65188

**SPN 1137      Engine Exhaust Gas Port 1 Temperature**

Temperature at the cylinder exhaust port of the engine.

Data Length:            2 bytes  
Resolution:            0.03125 deg C/bit, -273 deg C offset  
Data Range:            -273 to 1734.96875 deg C      Operational Range: same as data range  
Type:                    Measured  
Supporting Information:  
PGN reference:        65187

**SPN 1138      Engine Exhaust Gas Port 2 Temperature**

Temperature at the cylinder exhaust port of the engine.

Data Length:            2 bytes  
Resolution:            0.03125 deg C/bit, -273 deg C offset  
Data Range:            -273 to 1734.96875 deg C      Operational Range: same as data range  
Type:                    Measured  
Supporting Information:  
PGN reference:        65187

**SPN 1139      Engine Exhaust Gas Port 3 Temperature**

Temperature at the cylinder exhaust port of the engine.

Data Length:            2 bytes  
Resolution:            0.03125 deg C/bit, -273 deg C offset  
Data Range:            -273 to 1734.96875 deg C      Operational Range: same as data range  
Type:                    Measured  
Supporting Information:  
PGN reference:        65187

**SPN 1140      Engine Exhaust Gas Port 4 Temperature**

Temperature at the cylinder exhaust port of the engine.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65187

**SPN 1141      Engine Exhaust Gas Port 5 Temperature**

Temperature at the cylinder exhaust port of the engine.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65186

**SPN 1142      Engine Exhaust Gas Port 6 Temperature**

Temperature at the cylinder exhaust port of the engine.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65186

**SPN 1143      Engine Exhaust Gas Port 7 Temperature**

Temperature at the cylinder exhaust port of the engine.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65186

**SPN 1144      Engine Exhaust Gas Port 8 Temperature**

Temperature at the cylinder exhaust port of the engine.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65186

**SPN 1145      Engine Exhaust Gas Port 9 Temperature**

Temperature at the cylinder exhaust port of the engine.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65185

**SPN 1146      Engine Exhaust Gas Port 10 Temperature**

Temperature at the cylinder exhaust port of the engine.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65185

**SPN 1147      Engine Exhaust Gas Port 11 Temperature**

Temperature at the cylinder exhaust port of the engine.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65185

**SPN 1148      Engine Exhaust Gas Port 12 Temperature**

Temperature at the cylinder exhaust port of the engine.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65185

**SPN 1149      Engine Exhaust Gas Port 13 Temperature**

Temperature at the cylinder exhaust port of the engine.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65184

**SPN 1150      Engine Exhaust Gas Port 14 Temperature**

Temperature at the cylinder exhaust port of the engine.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65184

**SPN 1151      Engine Exhaust Gas Port 15 Temperature**

Temperature at the cylinder exhaust port of the engine.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65184

**SPN 1152      Engine Exhaust Gas Port 16 Temperature**

Temperature at the cylinder exhaust port of the engine.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65184

**SPN 1153      Engine Exhaust Gas Port 17 Temperature**

Temperature at the cylinder exhaust port of the engine.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65183

**SPN 1154      Engine Exhaust Gas Port 18 Temperature**

Temperature at the cylinder exhaust port of the engine.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65183

**SPN 1155      Engine Exhaust Gas Port 19 Temperature**

Temperature at the cylinder exhaust port of the engine.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65183

**SPN 1156      Engine Exhaust Gas Port 20 Temperature**

Temperature at the cylinder exhaust port of the engine.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65183

**SPN 1157      Engine Main Bearing 1 Temperature**

Temperature of the main bearing which supports the crankshaft of the engine.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65182

**SPN 1158      Engine Main Bearing 2 Temperature**

Temperature of the main bearing which supports the crankshaft of the engine.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65182

**SPN 1159      Engine Main Bearing 3 Temperature**

Temperature of the main bearing which supports the crankshaft of the engine.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65182



**SPN 1160      Engine Main Bearing 4 Temperature**

Temperature of the main bearing which supports the crankshaft of the engine.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65182

**SPN 1161      Engine Main Bearing 5 Temperature**

Temperature of the main bearing which supports the crankshaft of the engine.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65181

**SPN 1162      Engine Main Bearing 6 Temperature**

Temperature of the main bearing which supports the crankshaft of the engine.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65181

**SPN 1163      Engine Main Bearing 7 Temperature**

Temperature of the main bearing which supports the crankshaft of the engine.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65181

**SPN 1164      Engine Main Bearing 8 Temperature**

Temperature of the main bearing which supports the crankshaft of the engine.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65181

**SPN 1165      Engine Main Bearing 9 Temperature**

Temperature of the main bearing which supports the crankshaft of the engine.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65180

**SPN 1166      Engine Main Bearing 10 Temperature**

Temperature of the main bearing which supports the crankshaft of the engine.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65180

**SPN 1167      Engine Main Bearing 11 Temperature**

Temperature of the main bearing which supports the crankshaft of the engine.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65180

**SPN 1168      Engine Turbocharger Lube Oil Pressure 2**

Gage pressure of oil in turbocharger lubrication system.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 4 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 1000 kPa       | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65179               |                                       |

**SPN 1169      Engine Turbocharger 2 Speed**

Rotational velocity of rotor in the turbocharger.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 2 bytes             |                                       |
| Resolution:             | 4 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 257,020 rpm    | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65179               |                                       |

**SPN 1170      Engine Turbocharger 3 Speed**

Rotational velocity of rotor in the turbocharger.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 2 bytes             |                                       |
| Resolution:             | 4 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 257,020 rpm    | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65179               |                                       |

**SPN 1171      Engine Turbocharger 4 Speed**

Rotational velocity of rotor in the turbocharger.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 2 bytes             |                                       |
| Resolution:             | 4 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 257,020 rpm    | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65179               |                                       |

**(R) SPN 1172      Engine Turbocharger 1 Compressor Intake Temperature**

Temperature of the air entering the compressor side of the turbocharger.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65178

**(R) SPN 1173      Engine Turbocharger 2 Compressor Intake Temperature**

Temperature of the air entering the compressor side of the turbocharger.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65178

**(R) SPN 1174      Engine Turbocharger 3 Compressor Intake Temperature**

Temperature of the air entering the compressor side of the turbocharger.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65178

**(R) SPN 1175      Engine Turbocharger 4 Compressor Intake Temperature**

Temperature of the air entering the compressor side of the turbocharger.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65178

**(R) SPN 1176      Engine Turbocharger 1 Compressor Intake Pressure**

Gage pressure of the air entering the compressor side of the turbocharger.

Data Length: 2 bytes  
Resolution: 1/128 kPa/bit, -250 kPa offset  
Data Range: -250 kPa TO 251.99 kPa      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65177

**(R) SPN 1177      Engine Turbocharger 2 Compressor Intake Pressure**

Gage pressure of the air entering the compressor side of the turbocharger.

Data Length: 2 bytes  
Resolution: 1/128 kPa/bit, -250 kPa offset  
Data Range: -250 kPa TO 251.99 kPa      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65177

**(R) SPN 1178      Engine Turbocharger 3 Compressor Intake Pressure**

Gage pressure of the air entering the compressor side of the turbocharger.

Data Length: 2 bytes  
Resolution: 1/128 kPa/bit, -250 kPa offset  
Data Range: -250 kPa TO 251.99 kPa      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65177

**(R) SPN 1179      Engine Turbocharger 4 Compressor Intake Pressure**

Gage pressure of the air entering the compressor side of the turbocharger.

Data Length: 2 bytes  
Resolution: 1/128 kPa/bit, -250 kPa offset  
Data Range: -250 kPa TO 251.99 kPa      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65177

**(R) SPN 1180      Engine Turbocharger 1 Turbine Intake Temperature**

Temperature of the combustion by-products entering the turbine side of the turbocharger.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65176

**(R) SPN 1181      Engine Turbocharger 2 Turbine Intake Temperature**

Temperature of the combustion by-products entering the turbine side of the turbocharger.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65176

**(R) SPN 1182      Engine Turbocharger 3 Turbine Intake Temperature**

Temperature of the combustion by-products entering the turbine side of the turbocharger.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65176

**(R) SPN 1183      Engine Turbocharger 4 Turbine Intake Temperature**

Temperature of the combustion by-products entering the turbine side of the turbocharger.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65176

**SPN 1184      Engine Turbocharger 1 Turbine Outlet Temperature**

Temperature of the combustion by-products exiting the turbine side of the turbocharger.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65175

**SPN 1185      Engine Turbocharger 2 Turbine Outlet Temperature**

Temperature of the combustion by-products exiting the turbine side of the turbocharger.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65175

**SPN 1186      Engine Turbocharger 3 Turbine Outlet Temperature**

Temperature of the combustion by-products exiting the turbine side of the turbocharger.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65175

**SPN 1187      Engine Turbocharger 4 Turbine Outlet Temperature**

Temperature of the combustion by-products exiting the turbine side of the turbocharger.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65175

**(R) SPN 1188      Engine Turbocharger Wastegate Actuator 1 Position**

Position of the wastegate drive. A value of 0% represents fully closed and a value of 100% represents fully open.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65174               |                                       |

**(R) SPN 1189      Engine Turbocharger Wastegate Actuator 2 Position**

Position of the wastegate drive. A value of 0% represents fully closed and a value of 100% represents fully open.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65174               |                                       |

**(R) SPN 1190      Engine Turbocharger Wastegate Actuator 3 Position**

Position of the wastegate drive. A value of 0% represents fully closed and a value of 100% represents fully open.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65174               |                                       |

**(R) SPN 1191      Engine Turbocharger Wastegate Actuator 4 Position**

Position of the wastegate drive. A value of 0% represents fully closed and a value of 100% represents fully open.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65174               |                                       |



**SPN 1192      Engine Turbocharger Wastegate Actuator Control Air Pressure**

Gage pressure of the air used to control the actuator which opens and closes the wastegate valve.

Data Length: 1 byte  
Resolution: 4 kPa/bit, 0 offset  
Data Range: 0 to 1000 kPa  
Type: Measured  
Supporting Information:  
PGN reference: 65174

Operational Range: same as data range

**SPN 1193      Engine Operation Time Since Rebuild**

The time in engine operation since the last engine rebuild.

Data Length: 4 bytes  
Resolution: 1 s/bit, 0 offset  
Data Range: 0 to 4,211,081,215 s  
Type: Measured  
Supporting Information:  
PGN reference: 65173

Operational Range: same as data range

**SPN 1194      Anti-theft Encryption Seed Present Indicator**

Indicates the presence of the encryption seed random number.

00 - Random number is not present  
01 - Random number is present  
10 - Error  
11 - Not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 56320

Operational Range: same as data range

**SPN 1195      Anti-theft Password Valid Indicator**

Indicates the presence of a validated password.

00 - Password is not a validated password  
01 - Password is a validated password  
10 - Error  
11 - Not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 56320

Operational Range: same as data range

**SPN 1196      Anti-theft Component Status States**

Indicates whether or not the component can be started.

00 Unlocked  
01 Locked  
10 Blocked  
11 Not defined

00b - Unlocked = This state indicates that the component can be started without the end user being required to enter a password.

01b - Locked = This state indicates that the component can NOT be started (i.e., Unlocked) without the end user being required to enter a password.

10b - Blocked = This state indicates that a Lock or Unlock command cannot be executed because some other algorithm or command of higher priority is commanding differently.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 56320                    |                                       |

**SPN 1197      Anti-theft Modify Password States**

This parameter is used to indicate whether a password request was successfully performed, or if the request could not be performed due to system constraints or if the request was not a valid request.

00 Ok  
01 Full\_of\_Passwords  
10 Empty\_of\_Passwords  
11 Not\_valid

00b - Ok = This state indicates that the request was successfully performed.

01b - Full\_Of\_Passwords = This state indicates that the component can NOT store any additional passwords in its memory.

10b - Empty\_Of\_Passwords = This state indicates that the component would be empty of passwords (an unacceptable condition) if the password under which the end user is logged in, is deleted. Thus the delete password command is not successfully executed.

Note that if the Delete\_Password command is sent to a component that does not currently have a password the Empty\_Of\_Passwords state indicator shall be used.

11b - Not\_Valid = This state indicates that the request is not a valid one.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 56320                    |                                       |

**SPN 1198      *Anti-theft Random Number***

A seven byte random numeric code provided by the component in response to an anti-theft request. This parameter is sent as a numeric value utilizing the full range of 0 to 0xFFFFFFFFFFFFFFF. The most significant byte is sent first, not following the rules of Table 1.

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 7 bytes           |                                       |
| Resolution:             | ASCII, 0 offset   |                                       |
| Data Range:             | 0 to 255 per byte | Operational Range: same as data range |
| Type:                   | Status            |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 56320             |                                       |

**SPN 1199      *Anti-theft Encryption Indicator States***

This parameter is used to indicate if a random number seed is being requested, or if an encrypted password is being provided to the component.

00 Encryption\_Seed\_Request  
01 Encrypted\_Code\_Present  
10 Not defined  
11 Not\_Available

00b - Encryption\_Seed\_Request = This state represents a request to the component to provide a random number seed.

01b - Encrypted\_Code\_Present = This state is used to indicate that an encrypted password is being provided to the component.

11b - Not\_Available = This state is used to indicate that a random number is NOT being requested nor is an encrypted password being provided to the component.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 56576                    |                                       |

**SPN 1200*****Anti-theft Desired Exit Mode States***

This parameter is used to specify the desired triggers that are to be used by the component in deciding when to transition to the Locked state.

00 Lock\_Upon\_Operator\_Request  
01 Lock\_When\_Key\_Off  
10 Not defined  
11 Not\_Available

00b - Lock\_Upon\_Operator\_Request—This state is used to indicate that the end user would have to manually enter a password to Lock the engine.

01b - Lock\_When\_Keyoff—This state is used to indicate that the component would automatically transition to the Locked state when the end user turns off the engine (i.e. without the end user being required to manually enter the password).

11b - Not\_Available—This state is indicates that the option is not selectable or changeable by the operator via using current tool.

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 56576

Operational Range: same as data range

**SPN 1201      *Anti-theft Command States***

This parameter is used to identify the specific requests being sent to the component.

000 Add\_Password  
001 Delete\_Password  
010 Change\_Password  
011 Lock\_or\_Unlock  
100 Check\_Status  
101 Login  
110-111 Not defined

000b - Add\_Password—This state represents a request to the component to add a password to the list of passwords that the component has stored as valid codes. This command will not be performed if the component has already stored, the maximum number of passwords that it is capable of storing. The Login command must precede this command.

001b - Delete\_Password—This state represents a request to the component to delete the password (the same one used when the end-user logged in). See SPN 1197 for limitations.

010b - Change\_Password—This state represents a request to the component to change the password (the same one that the end-user logged in with) to a different password, which is to be specified by the end user. The Login command must precede this command.

011b - Lock\_Or\_Unlock—This state represents a request to the component to change from the Locked state to the Unlocked state or from the Unlocked state to the Locked state.

100b - Check\_Status—This state represents a request to check to see if the component is in the Locked or Unlocked state.

101b - Login—This state represents a request to validate the end user, before performing commands such as Add\_Password and Change\_Password.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 3 bits                   |                                       |
| Resolution:             | 8 states/3 bit, 0 offset |                                       |
| Data Range:             | 0 to 7                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 56576                    |                                       |

**SPN 1202      *Anti-theft Password Representation***

This parameter is the seven byte numeric code (i.e., 'encrypted password' or 'key') that is generated based on the encryption algorithm, the password supplied by the end user, and the random number seed given by the component. This parameter is sent as a numeric value utilizing the full range of 0 to 0xFFFFFFFFFFFFFFF. The most significant byte is sent first, not following the rules of Table 1.

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 7 bytes           |                                       |
| Resolution:             | ASCII, 0 offset   |                                       |
| Data Range:             | 0 to 255 per byte | Operational Range: same as data range |
| Type:                   | Status            |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 56576             |                                       |

**SPN 1203      Engine Auxiliary Coolant Pressure**

Gage pressure of coolant found in the intercooler which is located after the turbocharger.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 4 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 1000 kPa       | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65172               |                                       |

**SPN 1204      Electrical Load**

Electrical power delivered by the engine to the electrical system connected to the generator.

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 2 bytes              |                                       |
| Resolution:             | 0.5 kW/bit, 0 offset |                                       |
| Data Range:             | 0 to 32,127.5 kW     | Operational Range: same as data range |
| Type:                   | Measured             |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 65171                |                                       |

**SPN 1205      Safety Wire Status**

Status signal which indicates that the safety wire has been activated. When the safety wire is activated, the engine will not operate. This is used for maintenance purposes.

00 - Safety wire has not been activated  
01 - Safety wire has been activated  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65171                    |                                       |

**SPN 1206      Engine Turning Gear Engaged**

Status signal which indicates that the turning gear is engaged. The turning gear is used to turn the flywheel/crankshaft, for maintenance purposes, while the engine is not running.

00 - Not engaged  
01 - Engaged  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          |                          |                                       |

**SPN 1207      Engine ECU Temperature (OBSOLETE use SPN 1136)**

Temperature of the engine electronic control unit.

(21, 1207 are not to be used - obsolete)

|                         |                                      |                                       |
|-------------------------|--------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                              |                                       |
| Resolution:             | 0.03125 deg C/bit, -273 deg C offset |                                       |
| Data Range:             | -273 to 1734.96875 deg C             | Operational Range: same as data range |
| Type:                   | Measured                             |                                       |
| Supporting Information: |                                      |                                       |
| PGN reference:          |                                      |                                       |

**SPN 1208      Engine Pre-filter Oil Pressure**

Gage pressure of the engine oil before the oil reaches the oil filter.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 4 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 1000 kPa       | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65170               |                                       |

**(R) SPN 1209      Engine Exhaust Gas Pressure**

Gage pressure of the exhaust gasses as measured at the turbine intake of the turbocharger.

|                         |                                |                                       |
|-------------------------|--------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                        |                                       |
| Resolution:             | 1/128 kPa/bit, -250 kPa offset |                                       |
| Data Range:             | -250 kPa TO 251.99 kPa         | Operational Range: same as data range |
| Type:                   | Measured                       |                                       |
| Supporting Information: |                                |                                       |
| PGN reference:          | 65170                          |                                       |

**SPN 1210      Engine Fuel Rack Position**

Measured position of the engine fuel rack. A value of 0% rack represents no fueling and a value of 100% rack represents maximum fueling.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65170               |                                       |

**SPN 1211      Engine Build Hours Reset**

Command signal used to reset the engine rebuild hours.

00 Do not reset  
01 Reset  
10 Reserved  
11 Take no action

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 56832                    |                                       |

**SPN 1212      Engine Auxiliary Coolant Temperature**

Temperature of coolant found in the intercooler which is located after the turbocharger.

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 deg C/bit, -40 deg C offset |                                       |
| Data Range:             | -40 to 210 deg C              | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          | 65172                         |                                       |



**SPN 1237      Engine Shutdown Override Switch**

Switch signal which indicates the position of the engine shutdown override switch. This switch function allows the operator to override an impending engine shutdown.

00 - Off  
01 - On  
10 - Error  
11 - Not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 65265

Operational Range: same as data range

**SPN 1238      Traction Control Override Switch**

Switch signal which indicates the position of the traction control override switch. The traction control override signal disables the automatic traction control function allowing the wheels to spin.

00 - Off  
01 - On  
10 - Error  
11 - Not available or not installed

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 61441

Operational Range: same as data range

**SPN 1239      Engine Fuel Leakage 1**

Status signal which indicates fuel leakage in the fuel rail of the engine. Location can be either before or after the fuel pump.

00 - no leakage detected  
01 - leakage detected  
10 - Error  
11 - Not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 65169

Operational Range: same as data range

**SPN 1240      Engine Fuel Leakage 2**

Status signal which indicates fuel leakage in the fuel rail of the engine. Location can be either before or after the fuel pump.

00 - no leakage detected  
01 - leakage detected  
10 - Error  
11 - Not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 65169

Operational Range: same as data range

**SPN 1241      Engine Gas Mass Flow Rate 1**

Gas mass flow rate delivered to an engine through its first fuel control system. See SPN 3467 for the second fuel control system.

Data Length: 2 bytes  
Resolution: 0.05 kg/h per bit, 0 offset  
Data Range: 0 to 3212.75 kg/h  
Type: Measured  
Supporting Information:  
PGN reference: 65170

Operational Range: same as data range

**SPN 1242      Instantaneous Estimated Brake Power**

Estimate of the power developed by the engine.

Data Length: 2 bytes  
Resolution: 0.5 kW/bit, 0 offset  
Data Range: 0 to 32,127.5 kW  
Type: Measured  
Supporting Information:  
PGN reference: 65170

Operational Range: same as data range

**SPN 1243      *ABS Fully Operational***

Signal which indicates whether an ABS system is fully operational or whether its functionality is reduced by a defect or by an intended action (e.g., by activation of an ABS-off-road switch or during special diagnostic procedures). There are cases where the signal is necessary to fulfill legal regulations for special applications (e.g., switching off integrated retarders).

00 - Not Fully Operational  
01 - Fully Operational  
10 - Reserved  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61441                    |                                       |

**SPN 1244      *Engine Fuel Actuator 2 Control Command***

The control command to fuel actuator 2, normalized to percent, where 0% represents fully closed and 100% represents fully open. Typically, this fuel actuator is used to regulate low pressure natural gas flow rate, mixing into the air flow, which together then come into the engine. Using the standard convention for determining the position. Left/front is #1 (SPN 633) and right/rear is #2.

|                         |                        |                              |
|-------------------------|------------------------|------------------------------|
| Data Length:            | 2 bytes                |                              |
| Resolution:             | 0.0025 %/bit, 0 offset |                              |
| Data Range:             | 0 to 160.6375 %        | Operational Range: 0 to 100% |
| Type:                   | Status                 |                              |
| Supporting Information: |                        |                              |
| PGN reference:          | 61466                  |                              |

**SPN 1246      *Number of Engine Torque History Records***

Number of torque history records contained in the engine torque history PGN. A value of 0 is broadcast if no torque history records are stored in the ECU.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 1 record/bit, 0 offset |                                       |
| Data Range:             | 0 to 250 records       | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65168                  |                                       |

**SPN 1247      Engine Power**

Advertised engine power capability. Advertised power is what a customer will find on a sales sheet for an engine with a certain calibration.

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 2 bytes              |                                       |
| Resolution:             | 0.5 kW/bit, 0 offset |                                       |
| Data Range:             | 0 to 32,127.5 kW     | Operational Range: same as data range |
| Type:                   | Measured             |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 65168                |                                       |

**SPN 1248      Engine Peak Torque 1**

Maximum torque output of the current ECU calibration when the engine operates on torque curve 1. For calibrations that support two torque curves, this parameter shall be assigned the value of the lower curve. For calibrations that support only one curve, this parameter should be used.

|                         |                    |                                       |
|-------------------------|--------------------|---------------------------------------|
| Data Length:            | 2 bytes            |                                       |
| Resolution:             | 1 Nm/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 Nm     | Operational Range: same as data range |
| Type:                   | Measured           |                                       |
| Supporting Information: |                    |                                       |
| PGN reference:          | 65168              |                                       |

**SPN 1249      Engine Peak Torque 2**

Maximum torque output of the current ECU calibration when the engine operates on torque curve 2. For calibrations that support two torque curves, this parameter shall be assigned the value of the higher curve. For calibrations that support only one curve, this parameter should be set to "not available".

|                         |                    |                                       |
|-------------------------|--------------------|---------------------------------------|
| Data Length:            | 2 bytes            |                                       |
| Resolution:             | 1 Nm/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 Nm     | Operational Range: same as data range |
| Type:                   | Measured           |                                       |
| Supporting Information: |                    |                                       |
| PGN reference:          | 65168              |                                       |

**SPN 1250      Calibration Record Start Month**

Calendar month timestamp when an ECU record was established.

NOTE - A value of 0 for the month is null. The value 1 identifies January; 2 identifies February; etc.

|                         |                       |                                  |
|-------------------------|-----------------------|----------------------------------|
| Data Length:            | 1 byte                |                                  |
| Resolution:             | 1 month/bit, 0 offset |                                  |
| Data Range:             | 0 to 250 months       | Operational Range: 1 to 12 month |
| Type:                   | Measured              |                                  |
| Supporting Information: |                       |                                  |
| PGN reference:          | 65168                 |                                  |

**SPN 1251      Calibration Record Start Day**

Calendar day timestamp when an ECU record was established.

NOTE - A value of 0 for the date is null. The values 1, 2, 3, and 4 are used to identify the first day of the month; 5, 6, 7, and 8 identify the second day of the month; etc.

|                         |                         |                                      |
|-------------------------|-------------------------|--------------------------------------|
| Data Length:            | 1 byte                  |                                      |
| Resolution:             | 0.25 days/bit, 0 offset |                                      |
| Data Range:             | 0 to 62.5 days          | Operational Range: 0.25 to 31.75 day |
| Type:                   | Measured                |                                      |
| Supporting Information: |                         |                                      |
| PGN reference:          | 65168                   |                                      |

**SPN 1252      Calibration Record Start Year**

Calendar year timestamp when an ECU record was established.

NOTE - A value of 0 for the year identifies the year 1985; a value of 1 identifies 1986; etc.

|                         |                               |                                      |
|-------------------------|-------------------------------|--------------------------------------|
| Data Length:            | 1 byte                        |                                      |
| Resolution:             | 1 year/bit, 1985 years offset |                                      |
| Data Range:             | 1985 to 2235 years            | Operational Range: 1985 to 2235 year |
| Type:                   | Measured                      |                                      |
| Supporting Information: |                               |                                      |
| PGN reference:          | 65168                         |                                      |

**SPN 1253      Calibration Record Duration Time**

Duration in hours for which the engine operated in the conditions captured in the current record.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.05 hr/bit, 0 offset  |                                       |
| Data Range:             | 0 to 210,554,060.75 hr | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65168                  |                                       |

**SPN 1254      Torque Limiting Feature Status**

Status of an ECU feature which limits the torque output of the engine.

00 - Disabled  
01 - Enabled  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65168                    |                                       |

**SPN 1255      *Transmission Gear Ratio 1***

Gear ratio value stored in the ECU that is used to define a range of transmission gears for which a limit is applied to the engine output torque. Transmission gear ratio 1 should be the numerically highest transmission gear ratio breakpoint that defines ratio ranges for torque limits.

|                         |                    |                                       |
|-------------------------|--------------------|---------------------------------------|
| Data Length:            | 2 bytes            |                                       |
| Resolution:             | 0.01/bit, 0 offset |                                       |
| Data Range:             | 0 to 642.55        | Operational Range: same as data range |
| Type:                   | Measured           |                                       |
| Supporting Information: |                    |                                       |
| PGN reference:          | 65168              |                                       |

**SPN 1256      *Engine Torque Limit 1, Transmission***

Limit applied to the engine output torque during vehicle operation in transmission gear ratios numerically greater than transmission gear ratio 1 (see SPN 1255).

|                         |                    |                                       |
|-------------------------|--------------------|---------------------------------------|
| Data Length:            | 2 bytes            |                                       |
| Resolution:             | 1 Nm/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 Nm     | Operational Range: same as data range |
| Type:                   | Measured           |                                       |
| Supporting Information: |                    |                                       |
| PGN reference:          | 65168              |                                       |

**SPN 1257      *Transmission Gear Ratio 2***

Gear ratio value stored in the ECU that is used to define a range of transmission gears for which a limit is applied to the engine output torque. Transmission gear ratio 2 should be the numerically highest transmission gear ratio breakpoint less than transmission gear ratio 1 (see SPN 1255) that defines ratio ranges for torque limits.

|                         |                    |                                       |
|-------------------------|--------------------|---------------------------------------|
| Data Length:            | 2 bytes            |                                       |
| Resolution:             | 0.01/bit, 0 offset |                                       |
| Data Range:             | 0 to 642.55        | Operational Range: same as data range |
| Type:                   | Measured           |                                       |
| Supporting Information: |                    |                                       |
| PGN reference:          | 65168              |                                       |

**SPN 1258      *Engine Torque Limit 2, Transmission***

Limit applied to the engine output torque during vehicle operation in transmission gear ratios numerically less than or equal to transmission gear ratio 1 (see SPN 1255) and numerically greater than transmission gear ratio 2 (see SPN 1257). For example, with transmission gear ratio 1 equal to 12.0:1 and transmission gear ratio 2 equal to 5.0:1, vehicle operation in a transmission gear with a ratio of 6.0:1 will result in the application of engine torque limit 2, transmission.

|                         |                    |                                       |
|-------------------------|--------------------|---------------------------------------|
| Data Length:            | 2 bytes            |                                       |
| Resolution:             | 1 Nm/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 Nm     | Operational Range: same as data range |
| Type:                   | Measured           |                                       |
| Supporting Information: |                    |                                       |
| PGN reference:          | 65168              |                                       |

**SPN 1259      *Transmission Gear Ratio 3***

Gear ratio value stored in the ECU that is used to define a range of transmission gears for which a limit is applied to the engine output torque. Transmission gear ratio 3 should be the numerically highest transmission gear ratio breakpoint less than transmission gear ratio 2 (see SPN 1257) that defines ratio ranges for torque limits.

|                         |                    |                                       |
|-------------------------|--------------------|---------------------------------------|
| Data Length:            | 2 bytes            |                                       |
| Resolution:             | 0.01/bit, 0 offset |                                       |
| Data Range:             | 0 to 642.55        | Operational Range: same as data range |
| Type:                   | Measured           |                                       |
| Supporting Information: |                    |                                       |
| PGN reference:          | 65168              |                                       |

**SPN 1260      *Engine Torque Limit 3, Transmission***

Limit applied to the engine output torque during vehicle operation in transmission gear ratios numerically less than or equal to transmission gear ratio 2 (see SPN 1257) and numerically greater than transmission gear ratio 3 (see SPN 1259). For example, with transmission gear ratio 2 equal to 5.0:1 and transmission gear ratio 3 equal to 2.0:1, vehicle operation in a transmission gear with a ratio of 3.0:1 will result in the application of engine torque limit 3, transmission.

|                         |                    |                                       |
|-------------------------|--------------------|---------------------------------------|
| Data Length:            | 2 bytes            |                                       |
| Resolution:             | 1 Nm/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 Nm     | Operational Range: same as data range |
| Type:                   | Measured           |                                       |
| Supporting Information: |                    |                                       |
| PGN reference:          | 65168              |                                       |

**SPN 1261      *Engine Torque Limit 4, Transmission***

Limit applied to the engine output torque during vehicle operation in transmission gear ratios numerically less than or equal to transmission gear ratio 3 (see SPN 1259).

|                         |                    |                                       |
|-------------------------|--------------------|---------------------------------------|
| Data Length:            | 2 bytes            |                                       |
| Resolution:             | 1 Nm/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 Nm     | Operational Range: same as data range |
| Type:                   | Measured           |                                       |
| Supporting Information: |                    |                                       |
| PGN reference:          | 65168              |                                       |

**SPN 1262      *Engine Torque Limit 5, Switch***

Limit applied to the engine output torque based on activation of an ECU switch input.

|                         |                    |                                       |
|-------------------------|--------------------|---------------------------------------|
| Data Length:            | 2 bytes            |                                       |
| Resolution:             | 1 Nm/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 Nm     | Operational Range: same as data range |
| Type:                   | Measured           |                                       |
| Supporting Information: |                    |                                       |
| PGN reference:          | 65168              |                                       |

**SPN 1263      Engine Torque Limit 6, Axle Input**

Limit applied to the engine output torque based on the maximum allowable axle input torque. Axle input torque is calculated as the current engine torque output multiplied by the transmission gear ratio.

|                         |                    |                                       |
|-------------------------|--------------------|---------------------------------------|
| Data Length:            | 2 bytes            |                                       |
| Resolution:             | 2 Nm/bit, 0 offset |                                       |
| Data Range:             | 0 to 128,510 Nm    | Operational Range: same as data range |
| Type:                   | Measured           |                                       |
| Supporting Information: |                    |                                       |
| PGN reference:          | 65168              |                                       |

**SPN 1264      Engine Extended Crankcase Blow-by Pressure - duplicate (see SPN 22)**

Differential crankcase blow-by pressure as measured through a tube with a venturi.

(1264 not to be used – obsolete)

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 0.05 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 12.5 kPa          | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          |                        |                                       |

**SPN 1294      Engine Spark Plug 1**

The measured voltage of the spark event on Cylinder #1

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 2 bytes           |                                       |
| Resolution:             | 1 V/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 Volts | Operational Range: same as data range |
| Type:                   | Measured          |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 64887             |                                       |

**SPN 1295      Engine Spark Plug 2**

The measured voltage of the spark event on Cylinder #2

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 2 bytes           |                                       |
| Resolution:             | 1 V/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 Volts | Operational Range: same as data range |
| Type:                   | Measured          |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 64887             |                                       |



**SPN 1296      Engine Spark Plug 3**

The measured voltage of the spark event on Cylinder #3

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 2 bytes           |                                       |
| Resolution:             | 1 V/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 Volts | Operational Range: same as data range |
| Type:                   | Measured          |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 64887             |                                       |

**SPN 1297      Engine Spark Plug 4**

The measured voltage of the spark event on Cylinder #4

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 2 bytes           |                                       |
| Resolution:             | 1 V/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 Volts | Operational Range: same as data range |
| Type:                   | Measured          |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 64887             |                                       |

**SPN 1298      Engine Spark Plug 5**

The measured voltage of the spark event on Cylinder #5

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 2 bytes           |                                       |
| Resolution:             | 1 V/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 Volts | Operational Range: same as data range |
| Type:                   | Measured          |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 64886             |                                       |

**SPN 1299      Engine Spark Plug 6**

The measured voltage of the spark event on Cylinder #6

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 2 bytes           |                                       |
| Resolution:             | 1 V/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 Volts | Operational Range: same as data range |
| Type:                   | Measured          |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 64886             |                                       |

**SPN 1300      Engine Spark Plug 7**

The measured voltage of the spark event on Cylinder #7

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 2 bytes           |                                       |
| Resolution:             | 1 V/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 Volts | Operational Range: same as data range |
| Type:                   | Measured          |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 64886             |                                       |

**SPN 1301      Engine Spark Plug 8**

The measured voltage of the spark event on Cylinder #8

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 2 bytes           |                                       |
| Resolution:             | 1 V/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 Volts | Operational Range: same as data range |
| Type:                   | Measured          |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 64886             |                                       |

**SPN 1302      Engine Spark Plug 9**

The measured voltage of the spark event on Cylinder #9

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 2 bytes           |                                       |
| Resolution:             | 1 V/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 Volts | Operational Range: same as data range |
| Type:                   | Measured          |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 64885             |                                       |

**SPN 1303      Engine Spark Plug 10**

The measured voltage of the spark event on Cylinder #10

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 2 bytes           |                                       |
| Resolution:             | 1 V/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 Volts | Operational Range: same as data range |
| Type:                   | Measured          |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 64885             |                                       |

**SPN 1304      Engine Spark Plug 11**

The measured voltage of the spark event on Cylinder #11

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 2 bytes           |                                       |
| Resolution:             | 1 V/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 Volts | Operational Range: same as data range |
| Type:                   | Measured          |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 64885             |                                       |

**SPN 1305      Engine Spark Plug 12**

The measured voltage of the spark event on Cylinder #12

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 2 bytes           |                                       |
| Resolution:             | 1 V/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 Volts | Operational Range: same as data range |
| Type:                   | Measured          |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 64885             |                                       |

**SPN 1306      Engine Spark Plug 13**

The measured voltage of the spark event on Cylinder #13

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 2 bytes           |                                       |
| Resolution:             | 1 V/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 Volts | Operational Range: same as data range |
| Type:                   | Measured          |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 64884             |                                       |

**SPN 1307      Engine Spark Plug 14**

The measured voltage of the spark event on Cylinder #14

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 2 bytes           |                                       |
| Resolution:             | 1 V/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 Volts | Operational Range: same as data range |
| Type:                   | Measured          |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 64884             |                                       |

**SPN 1308      Engine Spark Plug 15**

The measured voltage of the spark event on Cylinder #15

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 2 bytes           |                                       |
| Resolution:             | 1 V/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 Volts | Operational Range: same as data range |
| Type:                   | Measured          |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 64884             |                                       |

**SPN 1309      Engine Spark Plug 16**

The measured voltage of the spark event on Cylinder #16

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 2 bytes           |                                       |
| Resolution:             | 1 V/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 Volts | Operational Range: same as data range |
| Type:                   | Measured          |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 64884             |                                       |

**SPN 1310      Engine Spark Plug 17**

The measured voltage of the spark event on Cylinder #17

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 2 bytes           |                                       |
| Resolution:             | 1 V/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 Volts | Operational Range: same as data range |
| Type:                   | Measured          |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 64883             |                                       |

**SPN 1311      Engine Spark Plug 18**

The measured voltage of the spark event on Cylinder #18

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 2 bytes           |                                       |
| Resolution:             | 1 V/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 Volts | Operational Range: same as data range |
| Type:                   | Measured          |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 64883             |                                       |

**SPN 1312      Engine Spark Plug 19**

The measured voltage of the spark event on Cylinder #19

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 2 bytes           |                                       |
| Resolution:             | 1 V/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 Volts | Operational Range: same as data range |
| Type:                   | Measured          |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 64883             |                                       |

**SPN 1313      Engine Spark Plug 20**

The measured voltage of the spark event on Cylinder #20

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 2 bytes           |                                       |
| Resolution:             | 1 V/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 Volts | Operational Range: same as data range |
| Type:                   | Measured          |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 64883             |                                       |

**SPN 1314      Engine Spark Plug 21**

The measured voltage of the spark event on Cylinder #21

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 2 bytes           |                                       |
| Resolution:             | 1 V/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 Volts | Operational Range: same as data range |
| Type:                   | Measured          |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 64882             |                                       |

**SPN 1315      Engine Spark Plug 22**

The measured voltage of the spark event on Cylinder #22

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 2 bytes           |                                       |
| Resolution:             | 1 V/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 Volts | Operational Range: same as data range |
| Type:                   | Measured          |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 64882             |                                       |

**SPN 1316      Engine Spark Plug 23**

The measured voltage of the spark event on Cylinder #23

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 2 bytes           |                                       |
| Resolution:             | 1 V/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 Volts | Operational Range: same as data range |
| Type:                   | Measured          |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 64882             |                                       |

**SPN 1317      Engine Spark Plug 24**

The measured voltage of the spark event on Cylinder #24

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 2 bytes           |                                       |
| Resolution:             | 1 V/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 Volts | Operational Range: same as data range |
| Type:                   | Measured          |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 64882             |                                       |

**SPN 1320      Engine External Shutdown Air Supply Pressure**

Pressure of the air used to shut off the fuel supply to the engine.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.5 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 32,127.5 kPa     | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65167                 |                                       |

**(R) SPN 1349      Engine Injector Metering Rail 2 Pressure**

The gage pressure of fuel in the metering rail #2 as delivered from the supply pump to the injector metering intake. See Figure SPN16\_A for fuel system related parameters. Although the figure does not show rail #2 it does show the relationship of rail pressure to other signals.

|                         |                         |                                       |
|-------------------------|-------------------------|---------------------------------------|
| Data Length:            | 2 bytes                 |                                       |
| Resolution:             | 1/256 MPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 251 MPa            | Operational Range: same as data range |
| Type:                   | Measured                |                                       |
| Supporting Information: |                         |                                       |
| PGN reference:          | 65243                   |                                       |

**SPN 1350      Time Since Last Service**

The vehicle operation time since the last service was performed. The type of service information is identified by the service component identification number.

|                         |                             |                                       |
|-------------------------|-----------------------------|---------------------------------------|
| Data Length:            | 2 bytes                     |                                       |
| Resolution:             | 1 hr/bit, -32,127 hr offset |                                       |
| Data Range:             | -32,127 to 32,128 hr        | Operational Range: same as data range |
| Type:                   | Measured                    |                                       |
| Supporting Information: |                             |                                       |
| PGN reference:          | 65166                       |                                       |

**SPN 1351      Air Compressor Status**

Indicates whether the air compressor is actively compressing air.

|    |                       |
|----|-----------------------|
| 00 | Compressor not active |
| 01 | Compressor active     |
| 10 | Error indicator       |
| 11 | Not available         |

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65198                    |                                       |

**SPN 1352      Engine Cylinder 1 Knock Level**

Used to indicate the level of knock for engine cylinder 1. The level of knock is reported using a relative scale where 0% is least level of knock, and increasing levels indicate more knock until 100% indicates the most severe level of knock allowed or measurable for the engine.

|                         |                   |                              |
|-------------------------|-------------------|------------------------------|
| Data Length:            | 1 byte            |                              |
| Resolution:             | 1 %/bit, 0 offset |                              |
| Data Range:             | 0 to 250 %        | Operational Range: 0 to 100% |
| Type:                   | Status            |                              |
| Supporting Information: |                   |                              |
| PGN reference:          | 61463             |                              |

**SPN 1353      Engine Cylinder 2 Knock Level**

Used to indicate the level of knock for engine cylinder 2. The level of knock is reported using a relative scale where 0% is least level of knock, and increasing levels indicate more knock until 100% indicates the most severe level of knock allowed or measurable for the engine.

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 1 byte            |                                       |
| Resolution:             | 1 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 250 %        | Operational Range: same as data range |
| Type:                   | Status            |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 61463             |                                       |

**SPN 1354      Engine Cylinder 3 Knock Level**

Used to indicate the level of knock for engine cylinder 3. The level of knock is reported using a relative scale where 0% is least level of knock, and increasing levels indicate more knock until 100% indicates the most severe level of knock allowed or measurable for the engine.

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 1 byte            |                                       |
| Resolution:             | 1 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 250 %        | Operational Range: same as data range |
| Type:                   | Status            |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 61463             |                                       |

**SPN 1355      Engine Cylinder 4 Knock Level**

Used to indicate the level of knock for engine cylinder 4. The level of knock is reported using a relative scale where 0% is least level of knock, and increasing levels indicate more knock until 100% indicates the most severe level of knock allowed or measurable for the engine.

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 1 byte            |                                       |
| Resolution:             | 1 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 250 %        | Operational Range: same as data range |
| Type:                   | Status            |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 61463             |                                       |

**SPN 1356      Engine Cylinder 5 Knock Level**

Used to indicate the level of knock for engine cylinder 5. The level of knock is reported using a relative scale where 0% is least level of knock, and increasing levels indicate more knock until 100% indicates the most severe level of knock allowed or measurable for the engine.

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 1 byte            |                                       |
| Resolution:             | 1 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 250 %        | Operational Range: same as data range |
| Type:                   | Status            |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 61463             |                                       |

**SPN 1357      Engine Cylinder 6 Knock Level**

Used to indicate the level of knock for engine cylinder 6. The level of knock is reported using a relative scale where 0% is least level of knock, and increasing levels indicate more knock until 100% indicates the most severe level of knock allowed or measurable for the engine.

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 1 byte            |                                       |
| Resolution:             | 1 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 250 %        | Operational Range: same as data range |
| Type:                   | Status            |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 61463             |                                       |



**SPN 1358**      **Engine Cylinder 7 Knock Level**

Used to indicate the level of knock for engine cylinder 7. The level of knock is reported using a relative scale where 0% is least level of knock, and increasing levels indicate more knock until 100% indicates the most severe level of knock allowed or measurable for the engine.

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 1 byte            |                                       |
| Resolution:             | 1 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 250 %        | Operational Range: same as data range |
| Type:                   | Status            |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 61463             |                                       |

**SPN 1359**      **Engine Cylinder 8 Knock Level**

Used to indicate the level of knock for engine cylinder 8. The level of knock is reported using a relative scale where 0% is least level of knock, and increasing levels indicate more knock until 100% indicates the most severe level of knock allowed or measurable for the engine.

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 1 byte            |                                       |
| Resolution:             | 1 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 250 %        | Operational Range: same as data range |
| Type:                   | Status            |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 61463             |                                       |

**SPN 1360**      **Engine Cylinder 9 Knock Level**

Used to indicate the level of knock for engine cylinder 9. The level of knock is reported using a relative scale where 0% is least level of knock, and increasing levels indicate more knock until 100% indicates the most severe level of knock allowed or measurable for the engine.

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 1 byte            |                                       |
| Resolution:             | 1 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 250 %        | Operational Range: same as data range |
| Type:                   | Status            |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 61464             |                                       |

**SPN 1361**      **Engine Cylinder 10 Knock Level**

Used to indicate the level of knock for engine cylinder 10. The level of knock is reported using a relative scale where 0% is least level of knock, and increasing levels indicate more knock until 100% indicates the most severe level of knock allowed or measurable for the engine.

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 1 byte            |                                       |
| Resolution:             | 1 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 250 %        | Operational Range: same as data range |
| Type:                   | Status            |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 61464             |                                       |

**SPN 1362      Engine Cylinder 11 Knock Level**

Used to indicate the level of knock for engine cylinder 11. The level of knock is reported using a relative scale where 0% is least level of knock, and increasing levels indicate more knock until 100% indicates the most severe level of knock allowed or measurable for the engine.

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 1 byte            |                                       |
| Resolution:             | 1 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 250 %        | Operational Range: same as data range |
| Type:                   | Status            |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 61464             |                                       |

**SPN 1363      Engine Cylinder 12 Knock Level**

Used to indicate the level of knock for engine cylinder 12. The level of knock is reported using a relative scale where 0% is least level of knock, and increasing levels indicate more knock until 100% indicates the most severe level of knock allowed or measurable for the engine.

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 1 byte            |                                       |
| Resolution:             | 1 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 250 %        | Operational Range: same as data range |
| Type:                   | Status            |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 61464             |                                       |

**SPN 1364      Engine Cylinder 13 Knock Level**

Used to indicate the level of knock for engine cylinder 13. The level of knock is reported using a relative scale where 0% is least level of knock, and increasing levels indicate more knock until 100% indicates the most severe level of knock allowed or measurable for the engine.

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 1 byte            |                                       |
| Resolution:             | 1 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 250 %        | Operational Range: same as data range |
| Type:                   | Status            |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 61464             |                                       |

**SPN 1365      Engine Cylinder 14 Knock Level**

Used to indicate the level of knock for engine cylinder 14. The level of knock is reported using a relative scale where 0% is least level of knock, and increasing levels indicate more knock until 100% indicates the most severe level of knock allowed or measurable for the engine.

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 1 byte            |                                       |
| Resolution:             | 1 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 250 %        | Operational Range: same as data range |
| Type:                   | Status            |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 61464             |                                       |

**SPN 1366      Engine Cylinder 15 Knock Level**

Used to indicate the level of knock for engine cylinder 15. The level of knock is reported using a relative scale where 0% is least level of knock, and increasing levels indicate more knock until 100% indicates the most severe level of knock allowed or measurable for the engine.

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 1 byte            |                                       |
| Resolution:             | 1 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 250 %        | Operational Range: same as data range |
| Type:                   | Status            |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 61464             |                                       |

**SPN 1367      Engine Cylinder 16 Knock Level**

Used to indicate the level of knock for engine cylinder 16. The level of knock is reported using a relative scale where 0% is least level of knock, and increasing levels indicate more knock until 100% indicates the most severe level of knock allowed or measurable for the engine.

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 1 byte            |                                       |
| Resolution:             | 1 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 250 %        | Operational Range: same as data range |
| Type:                   | Status            |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 61464             |                                       |

**SPN 1368      Engine Cylinder 17 Knock Level**

Used to indicate the level of knock for engine cylinder 17. The level of knock is reported using a relative scale where 0% is least level of knock, and increasing levels indicate more knock until 100% indicates the most severe level of knock allowed or measurable for the engine.

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 1 byte            |                                       |
| Resolution:             | 1 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 250 %        | Operational Range: same as data range |
| Type:                   | Status            |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 61465             |                                       |

**SPN 1369      Engine Cylinder 18 Knock Level**

Used to indicate the level of knock for engine cylinder 18. The level of knock is reported using a relative scale where 0% is least level of knock, and increasing levels indicate more knock until 100% indicates the most severe level of knock allowed or measurable for the engine.

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 1 byte            |                                       |
| Resolution:             | 1 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 250 %        | Operational Range: same as data range |
| Type:                   | Status            |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 61465             |                                       |

**SPN 1370      Engine Cylinder 19 Knock Level**

Used to indicate the level of knock for engine cylinder 19. The level of knock is reported using a relative scale where 0% is least level of knock, and increasing levels indicate more knock until 100% indicates the most severe level of knock allowed or measurable for the engine.

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 1 byte            |                                       |
| Resolution:             | 1 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 250 %        | Operational Range: same as data range |
| Type:                   | Status            |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 61465             |                                       |

**SPN 1371      Engine Cylinder 20 Knock Level**

Used to indicate the level of knock for engine cylinder 20. The level of knock is reported using a relative scale where 0% is least level of knock, and increasing levels indicate more knock until 100% indicates the most severe level of knock allowed or measurable for the engine.

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 1 byte            |                                       |
| Resolution:             | 1 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 250 %        | Operational Range: same as data range |
| Type:                   | Status            |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 61465             |                                       |

**SPN 1372      Engine Cylinder 21 Knock Level**

Used to indicate the level of knock for engine cylinder 21. The level of knock is reported using a relative scale where 0% is least level of knock, and increasing levels indicate more knock until 100% indicates the most severe level of knock allowed or measurable for the engine.

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 1 byte            |                                       |
| Resolution:             | 1 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 250 %        | Operational Range: same as data range |
| Type:                   | Status            |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 61465             |                                       |

**SPN 1373      Engine Cylinder 22 Knock Level**

Used to indicate the level of knock for engine cylinder 22. The level of knock is reported using a relative scale where 0% is least level of knock, and increasing levels indicate more knock until 100% indicates the most severe level of knock allowed or measurable for the engine.

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 1 byte            |                                       |
| Resolution:             | 1 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 250 %        | Operational Range: same as data range |
| Type:                   | Status            |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 61465             |                                       |

**SPN 1374      Engine Cylinder 23 Knock Level**

Used to indicate the level of knock for engine cylinder 23. The level of knock is reported using a relative scale where 0% is least level of knock, and increasing levels indicate more knock until 100% indicates the most severe level of knock allowed or measurable for the engine.

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 1 byte            |                                       |
| Resolution:             | 1 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 250 %        | Operational Range: same as data range |
| Type:                   | Status            |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 61465             |                                       |

**SPN 1375      Engine Cylinder 24 Knock Level**

Used to indicate the level of knock for engine cylinder 24. The level of knock is reported using a relative scale where 0% is least level of knock, and increasing levels indicate more knock until 100% indicates the most severe level of knock allowed or measurable for the engine.

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 1 byte            |                                       |
| Resolution:             | 1 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 250 %        | Operational Range: same as data range |
| Type:                   | Status            |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 61465             |                                       |

**SPN 1377      Engine Synchronization Switch**

This is the On/Off operation of the Multiple Unit Synchronization functionality. When it is enabled (i.e. On) the master engine will synchronize one or more slave engines to operate at the same speed. This switch position indicates whether this feature is disabled (off) or enabled (on).

00 Functionality is disabled (off)  
01 Functionality is enabled (on)  
10 Error  
11 Not available or Unused

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64971                    |                                       |

**SPN 1379      Service Component Identification**

Identification of component needing service. See Table SPN911\_A.

|                         |                    |                                       |
|-------------------------|--------------------|---------------------------------------|
| Data Length:            | 1 byte             |                                       |
| Resolution:             | 1 ID/bit, 0 offset |                                       |
| Data Range:             | 0 to 250 ID        | Operational Range: same as data range |
| Type:                   | Measured           |                                       |
| Supporting Information: |                    |                                       |
| PGN reference:          | 65166              |                                       |

**SPN 1380      Engine Oil Level Remote Reservoir**

Ratio of current volume of engine oil in a remote reservoir to the maximum required volume. If a single switch (on/off) is used, 20% and 100% respectively will be used where 100% means no oil needs to be added and 20% means oil needs to be added. If two switches are used, 20%, 50%, and 100% will be used where 20% indicates the oil is critically low, 50% indicates the oil level is low, and 100% means no oil needs to be added. For continuous sensors, the actual measured percent will be used.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65130               |                                       |

**(R) SPN 1381      Engine Fuel Supply Pump Intake Pressure**

Absolute pressure of fuel at the fuel supply pump intake. See Figures SPN16\_A & SPN16\_B

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 2 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 500 kPa        | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65130               |                                       |

**SPN 1382      Engine Fuel Filter (suction side) Differential Pressure**

Differential pressure measured across the fuel filter located between the fuel tank and the supply pump. See Figures SPN16\_A and SPN16\_B.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 2 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 500 kPa        | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65130               |                                       |

**SPN 1385      Auxiliary Temperature #1 (duplicate see also SPN 441)**

Temperature measured by auxiliary temperature sensor #1 or #2. Not to be used in place of existing SPNs.

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 deg C/bit, -40 deg C offset |                                       |
| Data Range:             | -40 to 210 deg C              | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          |                               |                                       |

**SPN 1386      Auxiliary Temperature #2 (duplicate see also SPN 442)**

Temperature measured by auxiliary temperature sensor #1 or #2. Not to be used in place of existing SPNs.

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 deg C/bit, -40 deg C offset |                                       |
| Data Range:             | -40 to 210 deg C              | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          |                               |                                       |

**SPN 1387      Auxiliary Pressure #1**

Pressure measured by auxiliary pressure sensor #1. Not to be used in place of existing SPNs.

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 1 byte               |                                       |
| Resolution:             | 16 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 4000 kPa        | Operational Range: same as data range |
| Type:                   | Measured             |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 65164                |                                       |

**SPN 1388      Auxiliary Pressure #2**

Pressure measured by auxiliary pressure sensor #2. Not to be used in place of existing SPNs.

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 1 byte               |                                       |
| Resolution:             | 16 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 4000 kPa        | Operational Range: same as data range |
| Type:                   | Measured             |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 65164                |                                       |

**SPN 1389      Engine Fuel Specific Gravity**

This parameter conveys the specific gravity of the gaseous fuel being used by the engine. The specific gravity of the fuel can then be used to compute the density of the fuel.

|                         |                      |                                |
|-------------------------|----------------------|--------------------------------|
| Data Length:            | 2 bytes              |                                |
| Resolution:             | 0.0001/bit, 0 offset |                                |
| Data Range:             | 0 to 6.4255          | Operational Range: 0 to 2.0000 |
| Type:                   | Status               |                                |
| Supporting Information: |                      |                                |
| PGN reference:          | 65202                |                                |

**(R) SPN 1390      Engine Fuel Valve 1 Intake Absolute Pressure**

The absolute pressure of gas on the intake side of the first system control valve. See SPN 3466 for Engine Fuel Valve 2.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65163                 |                                       |

**(R) SPN 1391      Engine Fuel Valve Differential Pressure**

The differential pressure between the intake and the outlet of a gaseous fuel valve.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65163                 |                                       |

**SPN 1392      Engine Air to Fuel Differential Pressure**

The differential pressure between the gaseous fuel and the air intake manifold.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65163                 |                                       |



**SPN 1393      Engine Cylinder #1 Ignition Transformer Secondary Output**

This parameter indicates the relative intensity of the secondary output voltage of the ignition transformer.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 1 %/bit, -125 % offset |                                       |
| Data Range:             | -125 to 125 %          | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65160                  |                                       |

**SPN 1394      Engine Cylinder #2 Ignition Transformer Secondary Output**

This parameter indicates the relative intensity of the secondary output voltage of the ignition transformer.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 1 %/bit, -125 % offset |                                       |
| Data Range:             | -125 to 125 %          | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65160                  |                                       |

**SPN 1395      Engine Cylinder #3 Ignition Transformer Secondary Output**

This parameter indicates the relative intensity of the secondary output voltage of the ignition transformer.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 1 %/bit, -125 % offset |                                       |
| Data Range:             | -125 to 125 %          | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65160                  |                                       |

**SPN 1396      Engine Cylinder #4 Ignition Transformer Secondary Output**

This parameter indicates the relative intensity of the secondary output voltage of the ignition transformer.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 1 %/bit, -125 % offset |                                       |
| Data Range:             | -125 to 125 %          | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65160                  |                                       |

**SPN 1397      Engine Cylinder #5 Ignition Transformer Secondary Output**

This parameter indicates the relative intensity of the secondary output voltage of the ignition transformer.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 1 %/bit, -125 % offset |                                       |
| Data Range:             | -125 to 125 %          | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65160                  |                                       |

**SPN 1398      Engine Cylinder #6 Ignition Transformer Secondary Output**

This parameter indicates the relative intensity of the secondary output voltage of the ignition transformer.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 1 %/bit, -125 % offset |                                       |
| Data Range:             | -125 to 125 %          | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65160                  |                                       |

**SPN 1399      Engine Cylinder #7 Ignition Transformer Secondary Output**

This parameter indicates the relative intensity of the secondary output voltage of the ignition transformer.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 1 %/bit, -125 % offset |                                       |
| Data Range:             | -125 to 125 %          | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65160                  |                                       |

**SPN 1400      Engine Cylinder #8 Ignition Transformer Secondary Output**

This parameter indicates the relative intensity of the secondary output voltage of the ignition transformer.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 1 %/bit, -125 % offset |                                       |
| Data Range:             | -125 to 125 %          | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65160                  |                                       |

**SPN 1401      Engine Cylinder #9 Ignition Transformer Secondary Output**

This parameter indicates the relative intensity of the secondary output voltage of the ignition transformer.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 1 %/bit, -125 % offset |                                       |
| Data Range:             | -125 to 125 %          | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65161                  |                                       |

**SPN 1402      Engine Cylinder #10 Ignition Transformer Secondary Output**

This parameter indicates the relative intensity of the secondary output voltage of the ignition transformer.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 1 %/bit, -125 % offset |                                       |
| Data Range:             | -125 to 125 %          | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65161                  |                                       |

**SPN 1403      Engine Cylinder #11 Ignition Transformer Secondary Output**

This parameter indicates the relative intensity of the secondary output voltage of the ignition transformer.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 1 %/bit, -125 % offset |                                       |
| Data Range:             | -125 to 125 %          | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65161                  |                                       |

**SPN 1404      Engine Cylinder #12 Ignition Transformer Secondary Output**

This parameter indicates the relative intensity of the secondary output voltage of the ignition transformer.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 1 %/bit, -125 % offset |                                       |
| Data Range:             | -125 to 125 %          | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65161                  |                                       |

**SPN 1405      Engine Cylinder #13 Ignition Transformer Secondary Output**

This parameter indicates the relative intensity of the secondary output voltage of the ignition transformer.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 1 %/bit, -125 % offset |                                       |
| Data Range:             | -125 to 125 %          | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65161                  |                                       |

**SPN 1406      Engine Cylinder #14 Ignition Transformer Secondary Output**

This parameter indicates the relative intensity of the secondary output voltage of the ignition transformer.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 1 %/bit, -125 % offset |                                       |
| Data Range:             | -125 to 125 %          | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65161                  |                                       |

**SPN 1407      Engine Cylinder #15 Ignition Transformer Secondary Output**

This parameter indicates the relative intensity of the secondary output voltage of the ignition transformer.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 1 %/bit, -125 % offset |                                       |
| Data Range:             | -125 to 125 %          | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65161                  |                                       |

**SPN 1408      Engine Cylinder #16 Ignition Transformer Secondary Output**

This parameter indicates the relative intensity of the secondary output voltage of the ignition transformer.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 1 %/bit, -125 % offset |                                       |
| Data Range:             | -125 to 125 %          | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65161                  |                                       |

**SPN 1409      Engine Cylinder #17 Ignition Transformer Secondary Output**

This parameter indicates the relative intensity of the secondary output voltage of the ignition transformer.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 1 %/bit, -125 % offset |                                       |
| Data Range:             | -125 to 125 %          | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65162                  |                                       |

**SPN 1410      Engine Cylinder #18 Ignition Transformer Secondary Output**

This parameter indicates the relative intensity of the secondary output voltage of the ignition transformer.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 1 %/bit, -125 % offset |                                       |
| Data Range:             | -125 to 125 %          | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65162                  |                                       |

**SPN 1411      Engine Cylinder #19 Ignition Transformer Secondary Output**

This parameter indicates the relative intensity of the secondary output voltage of the ignition transformer.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 1 %/bit, -125 % offset |                                       |
| Data Range:             | -125 to 125 %          | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65162                  |                                       |

**SPN 1412      Engine Cylinder #20 Ignition Transformer Secondary Output**

This parameter indicates the relative intensity of the secondary output voltage of the ignition transformer.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 1 %/bit, -125 % offset |                                       |
| Data Range:             | -125 to 125 %          | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65162                  |                                       |

**SPN 1413      Engine Cylinder #1 Ignition Timing**

The ignition timing of the cylinder.

|                         |                                |                                       |
|-------------------------|--------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                        |                                       |
| Resolution:             | 1/128 deg/bit, -200 deg offset |                                       |
| Data Range:             | -200 to 301.99 deg             | Operational Range: same as data range |
| Type:                   | Status                         |                                       |
| Supporting Information: |                                |                                       |
| PGN reference:          | 65154                          |                                       |

**SPN 1414      Engine Cylinder #2 Ignition Timing**

The ignition timing of the cylinder.

|                         |                                |                                       |
|-------------------------|--------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                        |                                       |
| Resolution:             | 1/128 deg/bit, -200 deg offset |                                       |
| Data Range:             | -200 to 301.99 deg             | Operational Range: same as data range |
| Type:                   | Status                         |                                       |
| Supporting Information: |                                |                                       |
| PGN reference:          | 65154                          |                                       |

**SPN 1415      Engine Cylinder #3 Ignition Timing**

The ignition timing of the cylinder.

|                         |                                |                                       |
|-------------------------|--------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                        |                                       |
| Resolution:             | 1/128 deg/bit, -200 deg offset |                                       |
| Data Range:             | -200 to 301.99 deg             | Operational Range: same as data range |
| Type:                   | Status                         |                                       |
| Supporting Information: |                                |                                       |
| PGN reference:          | 65154                          |                                       |

**SPN 1416      Engine Cylinder #4 Ignition Timing**

The ignition timing of the cylinder.

|                         |                                |                                       |
|-------------------------|--------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                        |                                       |
| Resolution:             | 1/128 deg/bit, -200 deg offset |                                       |
| Data Range:             | -200 to 301.99 deg             | Operational Range: same as data range |
| Type:                   | Status                         |                                       |
| Supporting Information: |                                |                                       |
| PGN reference:          | 65154                          |                                       |

**SPN 1417      Engine Cylinder #5 Ignition Timing**

The ignition timing of the cylinder.

|                         |                                |                                       |
|-------------------------|--------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                        |                                       |
| Resolution:             | 1/128 deg/bit, -200 deg offset |                                       |
| Data Range:             | -200 to 301.99 deg             | Operational Range: same as data range |
| Type:                   | Status                         |                                       |
| Supporting Information: |                                |                                       |
| PGN reference:          | 65155                          |                                       |

**SPN 1418      Engine Cylinder #6 Ignition Timing**

The ignition timing of the cylinder.

|                         |                                |                                       |
|-------------------------|--------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                        |                                       |
| Resolution:             | 1/128 deg/bit, -200 deg offset |                                       |
| Data Range:             | -200 to 301.99 deg             | Operational Range: same as data range |
| Type:                   | Status                         |                                       |
| Supporting Information: |                                |                                       |
| PGN reference:          | 65155                          |                                       |

**SPN 1419      Engine Cylinder #7 Ignition Timing**

The ignition timing of the cylinder.

|                         |                                |                                       |
|-------------------------|--------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                        |                                       |
| Resolution:             | 1/128 deg/bit, -200 deg offset |                                       |
| Data Range:             | -200 to 301.99 deg             | Operational Range: same as data range |
| Type:                   | Status                         |                                       |
| Supporting Information: |                                |                                       |
| PGN reference:          | 65155                          |                                       |

**SPN 1420      Engine Cylinder #8 Ignition Timing**

The ignition timing of the cylinder.

|                         |                                |                                       |
|-------------------------|--------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                        |                                       |
| Resolution:             | 1/128 deg/bit, -200 deg offset |                                       |
| Data Range:             | -200 to 301.99 deg             | Operational Range: same as data range |
| Type:                   | Status                         |                                       |
| Supporting Information: |                                |                                       |
| PGN reference:          | 65155                          |                                       |

**SPN 1421      Engine Cylinder #9 Ignition Timing**

The ignition timing of the cylinder.

|                         |                                |                                       |
|-------------------------|--------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                        |                                       |
| Resolution:             | 1/128 deg/bit, -200 deg offset |                                       |
| Data Range:             | -200 to 301.99 deg             | Operational Range: same as data range |
| Type:                   | Status                         |                                       |
| Supporting Information: |                                |                                       |
| PGN reference:          | 65156                          |                                       |

**SPN 1422      Engine Cylinder #10 Ignition Timing**

The ignition timing of the cylinder.

|                         |                                |                                       |
|-------------------------|--------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                        |                                       |
| Resolution:             | 1/128 deg/bit, -200 deg offset |                                       |
| Data Range:             | -200 to 301.99 deg             | Operational Range: same as data range |
| Type:                   | Status                         |                                       |
| Supporting Information: |                                |                                       |
| PGN reference:          | 65156                          |                                       |

**SPN 1423      Engine Cylinder #11 Ignition Timing**

The ignition timing of the cylinder.

|                         |                                |                                       |
|-------------------------|--------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                        |                                       |
| Resolution:             | 1/128 deg/bit, -200 deg offset |                                       |
| Data Range:             | -200 to 301.99 deg             | Operational Range: same as data range |
| Type:                   | Status                         |                                       |
| Supporting Information: |                                |                                       |
| PGN reference:          | 65156                          |                                       |

**SPN 1424      Engine Cylinder #12 Ignition Timing**

The ignition timing of the cylinder.

|                         |                                |                                       |
|-------------------------|--------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                        |                                       |
| Resolution:             | 1/128 deg/bit, -200 deg offset |                                       |
| Data Range:             | -200 to 301.99 deg             | Operational Range: same as data range |
| Type:                   | Status                         |                                       |
| Supporting Information: |                                |                                       |
| PGN reference:          | 65156                          |                                       |



**SPN 1425      Engine Cylinder #13 Ignition Timing**

The ignition timing of the cylinder.

|                         |                                |                                       |
|-------------------------|--------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                        |                                       |
| Resolution:             | 1/128 deg/bit, -200 deg offset |                                       |
| Data Range:             | -200 to 301.99 deg             | Operational Range: same as data range |
| Type:                   | Status                         |                                       |
| Supporting Information: |                                |                                       |
| PGN reference:          | 65157                          |                                       |

**SPN 1426      Engine Cylinder #14 Ignition Timing**

The ignition timing of the cylinder.

|                         |                                |                                       |
|-------------------------|--------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                        |                                       |
| Resolution:             | 1/128 deg/bit, -200 deg offset |                                       |
| Data Range:             | -200 to 301.99 deg             | Operational Range: same as data range |
| Type:                   | Status                         |                                       |
| Supporting Information: |                                |                                       |
| PGN reference:          | 65157                          |                                       |

**SPN 1427      Engine Cylinder #15 Ignition Timing**

The ignition timing of the cylinder.

|                         |                                |                                       |
|-------------------------|--------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                        |                                       |
| Resolution:             | 1/128 deg/bit, -200 deg offset |                                       |
| Data Range:             | -200 to 301.99 deg             | Operational Range: same as data range |
| Type:                   | Status                         |                                       |
| Supporting Information: |                                |                                       |
| PGN reference:          | 65157                          |                                       |

**SPN 1428      Engine Cylinder #16 Ignition Timing**

The ignition timing of the cylinder.

|                         |                                |                                       |
|-------------------------|--------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                        |                                       |
| Resolution:             | 1/128 deg/bit, -200 deg offset |                                       |
| Data Range:             | -200 to 301.99 deg             | Operational Range: same as data range |
| Type:                   | Status                         |                                       |
| Supporting Information: |                                |                                       |
| PGN reference:          | 65157                          |                                       |

**SPN 1429      Engine Cylinder #17 Ignition Timing**

The ignition timing of the cylinder.

|                         |                                |                                       |
|-------------------------|--------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                        |                                       |
| Resolution:             | 1/128 deg/bit, -200 deg offset |                                       |
| Data Range:             | -200 to 301.99 deg             | Operational Range: same as data range |
| Type:                   | Status                         |                                       |
| Supporting Information: |                                |                                       |
| PGN reference:          | 65158                          |                                       |

**SPN 1430      Engine Cylinder #18 Ignition Timing**

The ignition timing of the cylinder.

|                         |                                |                                       |
|-------------------------|--------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                        |                                       |
| Resolution:             | 1/128 deg/bit, -200 deg offset |                                       |
| Data Range:             | -200 to 301.99 deg             | Operational Range: same as data range |
| Type:                   | Status                         |                                       |
| Supporting Information: |                                |                                       |
| PGN reference:          | 65158                          |                                       |

**SPN 1431      Engine Cylinder #19 Ignition Timing**

The ignition timing of the cylinder.

|                         |                                |                                       |
|-------------------------|--------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                        |                                       |
| Resolution:             | 1/128 deg/bit, -200 deg offset |                                       |
| Data Range:             | -200 to 301.99 deg             | Operational Range: same as data range |
| Type:                   | Status                         |                                       |
| Supporting Information: |                                |                                       |
| PGN reference:          | 65158                          |                                       |

**SPN 1432      Engine Cylinder #20 Ignition Timing**

The ignition timing of the cylinder.

|                         |                                |                                       |
|-------------------------|--------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                        |                                       |
| Resolution:             | 1/128 deg/bit, -200 deg offset |                                       |
| Data Range:             | -200 to 301.99 deg             | Operational Range: same as data range |
| Type:                   | Status                         |                                       |
| Supporting Information: |                                |                                       |
| PGN reference:          | 65158                          |                                       |

**SPN 1433      Engine Desired Ignition Timing #1**

A programmable timing value specific to the engine's application. Factors affecting this value include both fuel type and the nature of the load being driven.

|                         |                                |                                       |
|-------------------------|--------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                        |                                       |
| Resolution:             | 1/128 deg/bit, -200 deg offset |                                       |
| Data Range:             | -200 to 301.99 deg             | Operational Range: same as data range |
| Type:                   | Status                         |                                       |
| Supporting Information: |                                |                                       |
| PGN reference:          | 65159                          |                                       |

**SPN 1434      Engine Desired Ignition Timing #2**

A programmable timing value specific to the engine's application. Factors affecting this value include both fuel type and the nature of the load being driven.

|                         |                                |                                       |
|-------------------------|--------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                        |                                       |
| Resolution:             | 1/128 deg/bit, -200 deg offset |                                       |
| Data Range:             | -200 to 301.99 deg             | Operational Range: same as data range |
| Type:                   | Status                         |                                       |
| Supporting Information: |                                |                                       |
| PGN reference:          | 65159                          |                                       |

**SPN 1435      Engine Desired Ignition Timing #3**

A programmable timing value specific to the engine's application. Factors affecting this value include both fuel type and the nature of the load being driven.

|                         |                                |                                       |
|-------------------------|--------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                        |                                       |
| Resolution:             | 1/128 deg/bit, -200 deg offset |                                       |
| Data Range:             | -200 to 301.99 deg             | Operational Range: same as data range |
| Type:                   | Status                         |                                       |
| Supporting Information: |                                |                                       |
| PGN reference:          | 65159                          |                                       |

**SPN 1436      Engine Actual Ignition Timing**

The actual ignition timing at the current engine conditions. This parameter may or may not be equal to one of the desired timing parameters (see SPNs 1433-1435), depending on the status of the engine.

|                         |                                |                                       |
|-------------------------|--------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                        |                                       |
| Resolution:             | 1/128 deg/bit, -200 deg offset |                                       |
| Data Range:             | -200 to 301.99 deg             | Operational Range: same as data range |
| Type:                   | Status                         |                                       |
| Supporting Information: |                                |                                       |
| PGN reference:          | 65159                          |                                       |

**SPN 1437      Road Speed Limit Status**

Status (active or not active) of the system used to limit maximum vehicle velocity.

00 - Active  
01 - Not Active  
10 - Error  
11 - Not available

NOTE - While somewhat inconsistent with other J1939 status parameters, the states defining 00 = active and 01 = inactive for Road Speed Limit Status are NOT typographical errors, and should be implemented as stated.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61443                    |                                       |

**SPN 1438      ABS/EBS Amber Warning Signal (Powered Vehicle)**

This parameter commands the ABS/EBS amber/yellow optical warning signal

00 Off  
01 On  
10 Reserved  
11 Take no action

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61441                    |                                       |

**SPN 1439      EBS Red Warning Signal**

This parameter commands the EBS red optical warning signal

00 Off  
01 On  
10 Reserved  
11 Take no action

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61441                    |                                       |

**SPN 1440      Engine Fuel Flow Rate 1**

The rate at which the fuel is flowing through a fuel valve.

|                         |                                         |                                       |
|-------------------------|-----------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                                 |                                       |
| Resolution:             | 0.1 m <sup>3</sup> /h per bit, 0 offset |                                       |
| Data Range:             | 0 to 6425.5 m <sup>3</sup> /h           | Operational Range: same as data range |
| Type:                   | Measured                                |                                       |
| Supporting Information: |                                         |                                       |
| PGN reference:          | 65153                                   |                                       |

**SPN 1441      Engine Fuel Flow Rate 2**

The rate at which the fuel is flowing through a fuel valve.

|                         |                                         |                                       |
|-------------------------|-----------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                                 |                                       |
| Resolution:             | 0.1 m <sup>3</sup> /h per bit, 0 offset |                                       |
| Data Range:             | 0 to 6425.5 m <sup>3</sup> /h           | Operational Range: same as data range |
| Type:                   | Measured                                |                                       |
| Supporting Information: |                                         |                                       |
| PGN reference:          | 65153                                   |                                       |

**SPN 1442      Engine Fuel Valve 1 Position**

The position of a gaseous fuel valve that is metering the fuel flow to the engine. 0% indicates no fuel flow through valve and 100% means maximum fuel flow through valve.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65153               |                                       |

**SPN 1443      Engine Fuel Valve 2 Position**

The position of a gaseous fuel valve that is metering the fuel flow to the engine. 0% indicates no fuel flow through valve and 100% means maximum fuel flow through valve.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65153               |                                       |

**SPN 1444      Engine Cylinder #1 Combustion Time**

The amount of time from when the ignition of the fuel is initiated to when the fuel is completely ignited (i.e., the flame front has propagated across the cylinder).

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.01 ms/bit, 0 offset |                                       |
| Data Range:             | 0 to 642.55 ms        | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65147                 |                                       |

**SPN 1445      Engine Cylinder #2 Combustion Time**

The amount of time from when the ignition of the fuel is initiated to when the fuel is completely ignited (i.e., the flame front has propagated across the cylinder).

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.01 ms/bit, 0 offset |                                       |
| Data Range:             | 0 to 642.55 ms        | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65147                 |                                       |

**SPN 1446      Engine Cylinder #3 Combustion Time**

The amount of time from when the ignition of the fuel is initiated to when the fuel is completely ignited (i.e., the flame front has propagated across the cylinder).

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.01 ms/bit, 0 offset |                                       |
| Data Range:             | 0 to 642.55 ms        | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65147                 |                                       |

**SPN 1447      Engine Cylinder #4 Combustion Time**

The amount of time from when the ignition of the fuel is initiated to when the fuel is completely ignited (i.e., the flame front has propagated across the cylinder).

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.01 ms/bit, 0 offset |                                       |
| Data Range:             | 0 to 642.55 ms        | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65147                 |                                       |

**SPN 1448      Engine Cylinder #5 Combustion Time**

The amount of time from when the ignition of the fuel is initiated to when the fuel is completely ignited (i.e., the flame front has propagated across the cylinder).

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.01 ms/bit, 0 offset |                                       |
| Data Range:             | 0 to 642.55 ms        | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65148                 |                                       |

**SPN 1449      Engine Cylinder #6 Combustion Time**

The amount of time from when the ignition of the fuel is initiated to when the fuel is completely ignited (i.e., the flame front has propagated across the cylinder).

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.01 ms/bit, 0 offset |                                       |
| Data Range:             | 0 to 642.55 ms        | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65148                 |                                       |

**SPN 1450      Engine Cylinder #7 Combustion Time**

The amount of time from when the ignition of the fuel is initiated to when the fuel is completely ignited (i.e., the flame front has propagated across the cylinder).

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.01 ms/bit, 0 offset |                                       |
| Data Range:             | 0 to 642.55 ms        | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65148                 |                                       |

**SPN 1451      Engine Cylinder #8 Combustion Time**

The amount of time from when the ignition of the fuel is initiated to when the fuel is completely ignited (i.e., the flame front has propagated across the cylinder).

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.01 ms/bit, 0 offset |                                       |
| Data Range:             | 0 to 642.55 ms        | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65148                 |                                       |

**SPN 1452      Engine Cylinder #9 Combustion Time**

The amount of time from when the ignition of the fuel is initiated to when the fuel is completely ignited (i.e., the flame front has propagated across the cylinder).

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.01 ms/bit, 0 offset |                                       |
| Data Range:             | 0 to 642.55 ms        | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65149                 |                                       |

**SPN 1453      Engine Cylinder #10 Combustion Time**

The amount of time from when the ignition of the fuel is initiated to when the fuel is completely ignited (i.e., the flame front has propagated across the cylinder).

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.01 ms/bit, 0 offset |                                       |
| Data Range:             | 0 to 642.55 ms        | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65149                 |                                       |

**SPN 1454      Engine Cylinder #11 Combustion Time**

The amount of time from when the ignition of the fuel is initiated to when the fuel is completely ignited (i.e., the flame front has propagated across the cylinder).

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.01 ms/bit, 0 offset |                                       |
| Data Range:             | 0 to 642.55 ms        | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65149                 |                                       |

**SPN 1455      Engine Cylinder #12 Combustion Time**

The amount of time from when the ignition of the fuel is initiated to when the fuel is completely ignited (i.e., the flame front has propagated across the cylinder).

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.01 ms/bit, 0 offset |                                       |
| Data Range:             | 0 to 642.55 ms        | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65149                 |                                       |



**SPN 1456      Engine Cylinder #13 Combustion Time**

The amount of time from when the ignition of the fuel is initiated to when the fuel is completely ignited (i.e., the flame front has propagated across the cylinder).

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.01 ms/bit, 0 offset |                                       |
| Data Range:             | 0 to 642.55 ms        | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65150                 |                                       |

**SPN 1457      Engine Cylinder #14 Combustion Time**

The amount of time from when the ignition of the fuel is initiated to when the fuel is completely ignited (i.e., the flame front has propagated across the cylinder).

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.01 ms/bit, 0 offset |                                       |
| Data Range:             | 0 to 642.55 ms        | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65150                 |                                       |

**SPN 1458      Engine Cylinder #15 Combustion Time**

The amount of time from when the ignition of the fuel is initiated to when the fuel is completely ignited (i.e., the flame front has propagated across the cylinder).

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.01 ms/bit, 0 offset |                                       |
| Data Range:             | 0 to 642.55 ms        | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65150                 |                                       |

**SPN 1459      Engine Cylinder #16 Combustion Time**

The amount of time from when the ignition of the fuel is initiated to when the fuel is completely ignited (i.e., the flame front has propagated across the cylinder).

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.01 ms/bit, 0 offset |                                       |
| Data Range:             | 0 to 642.55 ms        | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65150                 |                                       |

**SPN 1460      Engine Cylinder #17 Combustion Time**

The amount of time from when the ignition of the fuel is initiated to when the fuel is completely ignited (i.e., the flame front has propagated across the cylinder).

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.01 ms/bit, 0 offset |                                       |
| Data Range:             | 0 to 642.55 ms        | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65151                 |                                       |

**SPN 1461      Engine Cylinder #18 Combustion Time**

The amount of time from when the ignition of the fuel is initiated to when the fuel is completely ignited (i.e., the flame front has propagated across the cylinder).

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.01 ms/bit, 0 offset |                                       |
| Data Range:             | 0 to 642.55 ms        | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65151                 |                                       |

**SPN 1462      Engine Cylinder #19 Combustion Time**

The amount of time from when the ignition of the fuel is initiated to when the fuel is completely ignited (i.e., the flame front has propagated across the cylinder).

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.01 ms/bit, 0 offset |                                       |
| Data Range:             | 0 to 642.55 ms        | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65151                 |                                       |

**SPN 1463      Engine Cylinder #20 Combustion Time**

The amount of time from when the ignition of the fuel is initiated to when the fuel is completely ignited (i.e., the flame front has propagated across the cylinder).

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.01 ms/bit, 0 offset |                                       |
| Data Range:             | 0 to 642.55 ms        | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65151                 |                                       |

**SPN 1464      Engine Desired Combustion Time**

The desired combustion time based upon engine load and speed lookup maps.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.01 ms/bit, 0 offset |                                       |
| Data Range:             | 0 to 642.55 ms        | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65152                 |                                       |

**SPN 1465      Engine Average Combustion Time**

The average combustion time of all cylinders of an engine.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.01 ms/bit, 0 offset |                                       |
| Data Range:             | 0 to 642.55 ms        | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65152                 |                                       |

**SPN 1466      Steer Channel Mode**

Indicates the functional mode of steer channel of the tire pressure control system.

0000 Maintain  
0001 Inflate  
0010 Deflate  
0011 Confirm  
0100 Inflate Wait – System will inflate when conditions allow  
0101 Deflate Wait – System will deflate when conditions allow  
0110 Pressure Check  
0111-1101 Reserved  
1110 Error Condition  
1111 Not available

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 65144                     |                                       |

**SPN 1467      Trailer/tag Channel Mode**

Indicates the functional mode of trailer/tag channel of the tire pressure control system.

0000 Maintain  
0001 Inflate  
0010 Deflate  
0011 Confirm  
0100 Inflate Wait – System will inflate when conditions allow  
0101 Deflate Wait – System will deflate when conditions allow  
0110 Pressure Check  
0111-1101 Reserved  
1110 Error Condition  
1111 Not available

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 65144                     |                                       |

**SPN 1468      Drive Channel Mode**

Indicates the functional mode of trailer/tag channel of the tire pressure control system.

0000 Maintain  
0001 Inflate  
0010 Deflate  
0011 Confirm  
0100 Inflate Wait – System will inflate when conditions allow  
0101 Deflate Wait – System will deflate when conditions allow  
0110 Pressure Check  
0111-1101 Reserved  
1110 Error Condition  
1111 Not available

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 65144                     |                                       |

**SPN 1469      PCU Drive Solenoid Status**

Current state of the drive solenoid used to implement a tire pressure control system in its pneumatic control unit (PCU).

00 - Off  
01 - On  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65144

Operational Range: same as data range

**SPN 1470      PCU Steer Solenoid Status**

Current state of the steer solenoid used to implement a tire pressure control system in its pneumatic control unit (PCU).

00 - Off  
01 - On  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65144

Operational Range: same as data range

**SPN 1471      Tire Pressure Supply Switch Status**

Current state of an open/closed type switch used to determine if adequate pressure exists for system implementation.

00 - Off  
01 - On  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65144

Operational Range: same as data range

**SPN 1472      PCU Deflate Solenoid Status**

Current state of the deflate solenoid used to implement a tire pressure control system in its pneumatic control unit (PCU).

00 - Off  
01 - On  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65144

Operational Range: same as data range

**SPN 1473      PCU Control Solenoid Status**

Current state of the control solenoid used to implement a tire pressure control system in its pneumatic control unit (PCU).

00 - Off  
01 - On  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65144

Operational Range: same as data range

**SPN 1474      PCU Supply Solenoid Status**

Current state of the supply solenoid used to implement a tire pressure control system in its pneumatic control unit (PCU).

00 - Off  
01 - On  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65144

Operational Range: same as data range

**SPN 1475 PCU Trailer, Tag or Push Solenoid Status**

Current state of the trailer, tag, or push solenoid used to implement a tire pressure control system in its pneumatic control unit (PCU).

00 - Off  
01 - On  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65144                    |                                       |

**(R) SPN 1476 Engine Oil Specific Resistance**

Engine oil specific resistance used to describe the engine oil quality.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 1 byte                   |                                       |
| Resolution:             | 0.1 Mohm*m/bit, 0 offset |                                       |
| Data Range:             | 0 to 25 Mohm*m           | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          |                          |                                       |

**(R) SPN 1477 Engine Oil Kinematic Viscosity**

Engine oil kinematic viscosity used to describe the engine oil quality.

|                         |                                        |                                       |
|-------------------------|----------------------------------------|---------------------------------------|
| Data Length:            | 1 byte                                 |                                       |
| Resolution:             | 1 mm <sup>2</sup> /s per bit, 0 offset |                                       |
| Data Range:             | 0 to 250 mm <sup>2</sup> /s            | Operational Range: same as data range |
| Type:                   | Measured                               |                                       |
| Supporting Information: |                                        |                                       |
| PGN reference:          |                                        |                                       |

**(R) SPN 1478 Engine Oil Relative Dielectricity**

Engine oil relative dielectricity used to describe the engine oil quality.

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 1 byte            |                                       |
| Resolution:             | 0.1/bit, 0 offset |                                       |
| Data Range:             | 0 to 25.0         | Operational Range: same as data range |
| Type:                   | Measured          |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          |                   |                                       |

**SPN 1480      *Source Address of Controlling Device for Retarder Control***

The source address of the SAE J1939 device currently controlling the retarder. It is used to expand the torque mode parameter (see SPN 899) in cases where control is in response to an ECU that is not listed in Table SPN899\_A. Its value may be the source address of the ECU transmitting the message (which means that no external SAE J1939 message is providing the active command) or the source address of the SAE J1939 ECU that is currently providing the active command in a TSC1 (see PGN 0) or similar message. Note that if this parameter value is the same as the source address of the device transmitting it, the control may be due to a message on a non-SAE J1939 data link such as SAE J1922 or a proprietary link.

|                         |                                |                             |
|-------------------------|--------------------------------|-----------------------------|
| Data Length:            | 1 byte                         |                             |
| Resolution:             | 1 source address/bit, 0 offset |                             |
| Data Range:             | 0 to 255                       | Operational Range: 0 to 253 |
| Type:                   | Status                         |                             |
| Supporting Information: |                                |                             |
| PGN reference:          | 61440                          |                             |

**SPN 1481      *Source Address of Controlling Device for Brake Control***

The source address of the SAE J1939 device currently controlling the brake system. Its value may be the source address of the ECU transmitting the message (which means that no external SAE J1939 message is providing the active command) or the source address of the SAE J1939 ECU that is currently providing the active command in a TSC1 (see PGN 0) or similar message. Note that if this parameter value is the same as the source address of the device transmitting it, the control may be due to a message on a non-SAE J1939 data link such as SAE J1922 or a proprietary link.

|                         |                                |                             |
|-------------------------|--------------------------------|-----------------------------|
| Data Length:            | 1 byte                         |                             |
| Resolution:             | 1 source address/bit, 0 offset |                             |
| Data Range:             | 0 to 255                       | Operational Range: 0 to 253 |
| Type:                   | Status                         |                             |
| Supporting Information: |                                |                             |
| PGN reference:          | 61441                          |                             |

**SPN 1482      *Source Address of Controlling Device for Transmission Control***

The source address of the SAE J1939 device currently controlling the transmission. Its value may be the source address of the ECU transmitting the message (which means that no external SAE J1939 message is providing the active command) or the source address of the SAE J1939 ECU that is currently providing the active command in a TSC1 (see PGN 0) or similar message. Note that if this parameter value is the same as the source address of the device transmitting it, the control may be due to a message on a non-SAE J1939 data link such as SAE J1922 or a proprietary link.

|                         |                                |                             |
|-------------------------|--------------------------------|-----------------------------|
| Data Length:            | 1 byte                         |                             |
| Resolution:             | 1 source address/bit, 0 offset |                             |
| Data Range:             | 0 to 255                       | Operational Range: 0 to 253 |
| Type:                   | Status                         |                             |
| Supporting Information: |                                |                             |
| PGN reference:          | 61442                          |                             |

**SPN 1483      *Source Address of Controlling Device for Engine Control***

The source address of the SAE J1939 device currently controlling the engine. It is used to expand the torque mode parameter (see SPN 899) in cases where control is in response to an ECU that is not listed in Table SPN899\_A. Its value may be the source address of the ECU transmitting the message (which means that no external SAE J1939 message is



providing the active command) or the source address of the SAE J1939 ECU that is currently providing the active command in a TSC1 (see PGN 0) or similar message. Note that if this parameter value is the same as the source address of the device transmitting it, the control may be due to a message on a non-J1939 data link such as SAE J1922 or a proprietary link.

|                         |                                |                             |
|-------------------------|--------------------------------|-----------------------------|
| Data Length:            | 1 byte                         |                             |
| Resolution:             | 1 source address/bit, 0 offset |                             |
| Data Range:             | 0 to 255                       | Operational Range: 0 to 253 |
| Type:                   | Status                         |                             |
| Supporting Information: |                                |                             |
| PGN reference:          | 61444                          |                             |

#### **SPN 1487      *Illumination Brightness Percent***

Commanded backlight brightness level for all cab displays

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Status              |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 53248               |                                       |

#### **(R) SPN 1503      *Armrest Switch Matrix - Switch 1***

Switch input matrix for the module located in the armrest

00 : Off  
01: On  
10: Reserved  
11: Don't care/take no action

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64745                    |                                       |

**(R) SPN 1573      LED Display Data #1**

Informs display devices how to display the current vertical position.

Values which are less than 128 decimal are bit-mapped values and any combination of these values is considered a valid value. For example communicating the "High Fine LED on" value to the display would result in the High Fine LED being turned on. Communicating a value with the "High Fine LED on" bit set to "1" and the "On-Grade LED on" bit set to "1" should result in the display turning on the High Fine LED AND the On-Grade LED.

Values 128 decimal and above are discrete states. Any bit-mapped combination of these states are invalid unless the results correspond to one of the states defined. For example, the result of adding the "Low Coarse" and "Low Medium" states results in the "Low Medium" state, which is valid. However, adding the "Low Medium" and the "Low Fine" states results in an value which does not have a defined state and is invalid.

00000010 High Coarse LED on  
00000100 High Fine LED on  
00001000 On-grade LED on  
00010000 Low Fine LED on  
00100000 Low Coarse LED on

10000000 Low Coarse  
10000001 Low Medium/Coarse  
10000010 Low Medium  
10000011 Low Medium/Fine  
10000100 Low Fine  
10010000 On Grade  
10010001 High Fine  
10010010 High Medium/Fine  
10010011 High Medium  
10010100 High Medium/Coarse  
10010101 High Coarse  
10011111 No data (i.e. no laser strikes)  
11111110 Error  
11111111 Not Available

Undefined values between 10100000 binary and 11111101 binary are reserved for future use.

Data Length:            8 bits  
Resolution:            256 states/8 bit, 0 offset  
Data Range:            0 to 255  
Type:                    Status  
Supporting Information:  
PGN reference:        65142

Operational Range: same as data range

**SPN 1574      *Laser Strike Vertical Deviation***

The calculated distance from the laser strike position to the current land leveling system reference point.

|                         |                              |                                                                                                                                                                                    |
|-------------------------|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data Length:            | 2 bytes                      |                                                                                                                                                                                    |
| Resolution:             | 0.1 mm/bit, -3,200 mm offset |                                                                                                                                                                                    |
| Data Range:             | -3,200 to 3,225.5 mm         | Operational Range: -3200 to +3200 mm, negative values are below grade, positive values are above grade, zero is on grade, 0xFE03 indicates that the sensor can not sense the laser |
| Type:                   | Measured                     |                                                                                                                                                                                    |
| Supporting Information: |                              |                                                                                                                                                                                    |
| PGN reference:          | 65141                        |                                                                                                                                                                                    |

**SPN 1575      *Modify Leveling System Set Point***

Used to control and coordinate the set point for the leveling system.

Operating Range: -3200 to +3200 mm, negative values are below current position, positive values are above current position, zero is no change.

Parameter specific parameter:

0xFE01 indicates Stop modifying the set point  
0xFE03 indicates Raise the current set point by 5 mm  
0xFE11 indicates Lower the current set point by 5 mm  
0xFE13 indicates Search for laser or target  
0xFE15 indicates go to the Park position  
0xFE17 indicates go to the Bench position

|                         |                              |                                       |
|-------------------------|------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                      |                                       |
| Resolution:             | 0.1 mm/bit, -3,200 mm offset |                                       |
| Data Range:             | -3,200 to 3,225.5 mm         | Operational Range: same as data range |
| Type:                   | Measured                     |                                       |
| Supporting Information: |                              |                                       |
| PGN reference:          | 65140                        |                                       |

**SPN 1576      *Mast Position***

Used to monitor the position of the sensor attached to the land leveling mast.

|                         |                              |                                                                                                                                                  |
|-------------------------|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| Data Length:            | 2 bytes                      |                                                                                                                                                  |
| Resolution:             | 0.1 mm/bit, -3,200 mm offset |                                                                                                                                                  |
| Data Range:             | -3,200 to 3,225.5 mm         | Operational Range: -3200 to +3200 mm, negative values are below current position, positive values are above current position, zero is no change. |
| Type:                   | Measured                     |                                                                                                                                                  |
| Supporting Information: |                              |                                                                                                                                                  |
| PGN reference:          | 65139                        |                                                                                                                                                  |

**SPN 1577      Blade Duration and Direction**

Used to indicate the duration and direction that the land leveling system blade moves.

|                         |                                  |                                                                                                                                                              |
|-------------------------|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data Length:            | 2 bytes                          |                                                                                                                                                              |
| Resolution:             | 0.1 sec/bit, -3,276.8 sec offset |                                                                                                                                                              |
| Data Range:             | -3276.8 to 3148.7 sec            | Operational Range: -3276.8 to 3276.8 sec, negative values indicate move the blade up, positive values indicate move the blade down, zero indicates no change |
| Type:                   | Status                           |                                                                                                                                                              |
| Supporting Information: |                                  |                                                                                                                                                              |
| PGN reference:          | 65138                            |                                                                                                                                                              |

**SPN 1578      Blade Control Mode**

Allows the user to select the type of blade control for the land leveling system.

00000000 Manual mode  
00000001 Automatic mode  
00000010 Inactive automatic mode  
All other values Reserved

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 8 bits                     |                                       |
| Resolution:             | 256 states/8 bit, 0 offset |                                       |
| Data Range:             | 0 to 255                   | Operational Range: same as data range |
| Type:                   | Status                     |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 65138                      |                                       |

**SPN 1579      Laser Tracer Target Deviation**

The calculated distance for the laser target to the current laser tracer reference point.

Parameter specific parameter: 0xFE03 indicates that the sensor can not sense the laser

|                         |                              |                                                                                                                                 |
|-------------------------|------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| Data Length:            | 2 bytes                      |                                                                                                                                 |
| Resolution:             | 0.1 mm/bit, -3,200 mm offset |                                                                                                                                 |
| Data Range:             | -3,200 to 3,225.5 mm         | Operational Range: -3200 to +3200 mm, negative values are below setpoint, positive values are above setpoint, zero is on grade. |
| Type:                   | Measured                     |                                                                                                                                 |
| Supporting Information: |                              |                                                                                                                                 |
| PGN reference:          | 65137                        |                                                                                                                                 |

**SPN 1580      *Laser Tracer Vertical Distance***

The elevation of the laser tracer sensor in a laser leveling system.

Data Length:            2 bytes  
Resolution:            0.1 mm/bit, 0 offset  
Data Range:            0 to 6,425.5 mm (0 to 6.4255 m)      Operational Range: 0 to 6400 mm  
Type:                    Measured  
Supporting Information:  
PGN reference:           65137

**SPN 1581      *Laser Tracer Horizontal Deviation***

The calculated percent deviation between the target distance and the center of the laser tracer.

Data Length:            1 byte  
Resolution:            1 %/bit, 0 offset  
Data Range:            0 to 250 %      Operational Range: 0 to 200%, 0 to 99% indicates target is left of center, 101 to 200% indicates target is right of center, 100% indicates target is centered, 0xFF indicates previous pass mode and thus no horizontal deviation  
  
Type:                    Measured  
Supporting Information:  
PGN reference:           65137

**(R) SPN 1582      LED Display Data #2**

Informs display devices how to display the current position of the laser tracer.

Values which are less than 128 decimal are bit-mapped values and any combination of these values is considered a valid value. For example communicating the "Up LED on" value to the display would result in the Up LED being turned on. Communicating a value with the "Up LED on" bit set to "1" and that "On-Grade 'A' LED on" bit set to "1" should result in the display turning on the Up LED AND the On-Grade "A" LED.

Values 128 decimal and above are discrete states. Any bit-mapped combination of these states are invalid unless the results correspond to one of the states defined. For example, the result of adding the "Low Coarse" and "Low Medium" states results in the "Low Medium" state, which is valid. However, adding the "Low Medium" and the "Low Fine" states results in an value which does not have a defined state and is invalid.

00000001 On-grade "A" LED on  
 00000010 On-grade "B" LED on  
 00000100 On-grade "C" LED on  
 00001000 Up LED on  
 00010000 Down LED on  
 00100000 Left LED on  
 01000000 Right LED on

00000001 On-grade "A" LED on  
 00000010 On-grade "B" LED on  
 00000100 On-grade "C" LED on  
 00001000 Up LED on  
 00010000 Down LED on  
 00100000 Left LED on  
 01000000 Right LED on

10000000 Low Coarse  
 10000001 Low Medium/Coarse  
 10000010 Low Medium  
 10000011 Low Medium/Fine  
 10000100 Low Fine  
 10010000 On Grade  
 10010001 High Fine  
 10010010 High Medium/Fine  
 10010011 High Medium  
 10010100 High Medium/Coarse  
 10010101 High Coarse  
 10011111 No data (i.e. no laser strikes)  
 11111110 Error  
 11111111 Not Available

Undefined values between 10100000 binary and 11111101 binary are reserved for future use.

Data Length: 8 bits  
 Resolution: 256 states/8 bit, 0 offset  
 Data Range: 0 to 255  
 Type: Status  
 Supporting Information:  
 PGN reference: 65137

Operational Range: same as data range

**SPN 1583      *Laser Tracer Information***

Provides the status of the laser tracer to the operator.

00000001 Laser power is on  
00000010 Laser is ready  
00000100 Valid target (1 = yes)  
00001000 Previous pass (1 = yes)  
00010000 Stringline (1 = yes)  
00100000 Curb (1 = yes)  
All other values Reserved

Data Length:            8 bits  
Resolution:            256 states/8 bit, 0 offset  
Data Range:            0 to 255  
Type:                    Status  
Supporting Information:  
PGN reference:        65137

Operational Range: same as data range

**SPN 1584      *Service Component Identification***

Identification of component needing service. See Table SPN911\_A.

Data Length:            1 byte  
Resolution:            1 ID/bit, 0 offset  
Data Range:            0 to 250 ID  
Type:                    Measured  
Supporting Information:  
PGN reference:        56832

Operational Range: same as data range

**SPN 1585      *Powered Vehicle Weight***

Total mass imposed by the tires of the powered vehicle on the road surface. Does not include the trailer.

Data Length:            2 bytes  
Resolution:            10 kg/bit, 0 offset  
Data Range:            0 to 642,550 kg  
Type:                    Measured  
Supporting Information:  
PGN reference:        65136

Operational Range: same as data range

**SPN 1586      *Speed of forward vehicle***

Absolute velocity of the preceding vehicle situated within 250 m in the same lane and moving in the same direction.

Data Length:            1 byte  
Resolution:            1 km/h per bit, 0 offset  
Data Range:            0 to 250 km/h  
Type:                    Measured  
Supporting Information:  
PGN reference:        65135

Operational Range: 0xFF = no vehicle detected

**SPN 1587      *Distance to forward vehicle***

Distance to the preceding vehicle situated within 250 m in the same lane and moving in the same direction.

|                         |                   |                                               |
|-------------------------|-------------------|-----------------------------------------------|
| Data Length:            | 1 byte            |                                               |
| Resolution:             | 1 m/bit, 0 offset |                                               |
| Data Range:             | 0 to 250 m        | Operational Range: 0xFF = no vehicle detected |
| Type:                   | Measured          |                                               |
| Supporting Information: |                   |                                               |
| PGN reference:          | 65135             |                                               |

**SPN 1588      *Adaptive Cruise Control Set Speed***

Value of the desired (chosen) velocity of the adaptive cruise control system.

|                         |                          |                                  |
|-------------------------|--------------------------|----------------------------------|
| Data Length:            | 1 byte                   |                                  |
| Resolution:             | 1 km/h per bit, 0 offset |                                  |
| Data Range:             | 0 to 250 km/h            | Operational Range: 0 to 120 km/h |
| Type:                   | Status                   |                                  |
| Supporting Information: |                          |                                  |
| PGN reference:          | 65135                    |                                  |

**SPN 1589      *Adaptive cruise control set distance mode***

Selected distance mode for adaptive cruise control.

000 ACC Distance mode #1 (largest distance)  
001 ACC Distance mode #2  
010 ACC Distance mode #3  
011 ACC Distance mode #4  
100 ACC Distance mode #5 (shortest distance)  
101 Conventional cruise control mode  
110 Error condition  
111 Not available/not valid

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 3 bits                   |                                       |
| Resolution:             | 8 states/3 bit, 0 offset |                                       |
| Data Range:             | 0 to 7                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65135                    |                                       |



**SPN 1590      Adaptive Cruise Control Mode**

This parameter is used to indicate the current state, or mode, of operation by the Adaptive Cruise Control (ACC) device. The states characterize independent system states (e.g., it is not possible to express distance control active and overtake mode simultaneously). ACC must not switch itself off while active because the driver expects it to work. So if an error occurs, the ACC must signal that to the driver so that the driver knows that he has to switch off the ACC.

000 Off (Standby, enabled, ready for activation)  
001 Speed control active  
010 Distance control active  
011 Overtake mode  
100 Hold mode  
101 Finish mode  
110 Disabled or error condition  
111 Not available/not valid

000b - Off—Used to indicate the ACC is enabled in calibration or configuration and there are no faults that would prevent the system from operating.

001b - Speed Control Active—Used to indicate that ACC is on but not currently sending control messages. In other words, there is no target ahead and regular vehicle cruise control is controlling the vehicle speed to the driver's set speed.

010b - Distance Control Active—Used to indicate that ACC is on and actively sending control messages to maintain the appropriate following interval.

011b - Overtake Mode—Used to indicate that ACC is on but temporarily disabled because the driver is manually overriding cruise control by using either the accelerator pedal or the cruise control "accel" switch.

100b - Hold Mode—Used to indicate that the ACC has lost the previous target vehicle and is in HOLD mode. In this mode, the ACC shall limit the speed to the speed held when the target was lost. For example, if the driver activates the typical cruise buttons (Resume/Inc/Dec) the HOLD mode shall be exited and normal cruise functionality resumed. If a new target is detected, the Distance Control Active mode (010b) is again entered, unless existing conditions prohibit this.

101b - Finish Mode—Used to indicate that ACC is on with no target ahead, and ACC is currently sending control messages to return to the driver's set speed. This occurs when the target the ACC system was tracking moves out of the way so ACC returns the vehicle to the driver's set speed.

110b - Disabled or Error Condition—Used to indicate that ACC is in an error state and can not operate.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 3 bits                   |                                       |
| Resolution:             | 8 states/3 bit, 0 offset |                                       |
| Data Range:             | 0 to 7                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65135                    |                                       |

**SPN 1591      Road curvature**

Estimated value of the current road curvature for use by the adaptive cruise control system. Positive values are used for left curves. Curvature is the inverse of the radius and is zero for straight roads.

|                         |                                      |                                       |
|-------------------------|--------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                              |                                       |
| Resolution:             | 1/128 1/km per bit, -250 1/km offset |                                       |
| Data Range:             | -250 to 251.992 1/km                 | Operational Range: same as data range |
| Type:                   | Status                               |                                       |
| Supporting Information: |                                      |                                       |
| PGN reference:          | 65135                                |                                       |

**SPN 1592      *Front Axle, Left Wheel Speed***

High resolution measurement of the speed of the left wheel on the front axle.

|                         |                              |                                       |
|-------------------------|------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                      |                                       |
| Resolution:             | 1/256 km/h per bit, 0 offset |                                       |
| Data Range:             | 0 to 250.996 km/h            | Operational Range: same as data range |
| Type:                   | Measured                     |                                       |
| Supporting Information: |                              |                                       |
| PGN reference:          | 65134                        |                                       |

**SPN 1593      *Front axle, right wheel speed***

High resolution measurement of the speed of the right wheel on the front axle.

|                         |                              |                                       |
|-------------------------|------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                      |                                       |
| Resolution:             | 1/256 km/h per bit, 0 offset |                                       |
| Data Range:             | 0 to 250.996 km/h            | Operational Range: same as data range |
| Type:                   | Measured                     |                                       |
| Supporting Information: |                              |                                       |
| PGN reference:          | 65134                        |                                       |

**SPN 1594      *Rear axle, left wheel speed***

High resolution measurement of the speed of the left wheel on the rear axle.

|                         |                              |                                       |
|-------------------------|------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                      |                                       |
| Resolution:             | 1/256 km/h per bit, 0 offset |                                       |
| Data Range:             | 0 to 250.996 km/h            | Operational Range: same as data range |
| Type:                   | Measured                     |                                       |
| Supporting Information: |                              |                                       |
| PGN reference:          | 65134                        |                                       |

**SPN 1595      *Rear axle, right wheel speed***

High resolution measurement of the speed of the right wheel on the rear axle.

|                         |                              |                                       |
|-------------------------|------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                      |                                       |
| Resolution:             | 1/256 km/h per bit, 0 offset |                                       |
| Data Range:             | 0 to 250.996 km/h            | Operational Range: same as data range |
| Type:                   | Measured                     |                                       |
| Supporting Information: |                              |                                       |
| PGN reference:          | 65134                        |                                       |

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**SPN 1601      Local minute offset**

The minute component of the offset between the UTC time and date and a local time zone time and date. This is the number of minutes to add to UTC (Universal Time Coordinate) time and date to convert to the time and date in the local time zone. The Local Offset is a positive value for time zones East of the Prime Meridian to the International Date Line. The Local Offset is a negative value for time zones West of the Prime Meridian to the International Date Line. The Local Minute Offset is only applicable when the Time and Date parameters are reported as UTC time and date. Refer to SPN 1602 for details.

|                         |                            |                                   |
|-------------------------|----------------------------|-----------------------------------|
| Data Length:            | 1 byte                     |                                   |
| Resolution:             | 1 min/bit, -125 min offset |                                   |
| Data Range:             | -125 to 125 mins           | Operational Range: -59 to +59 min |
| Type:                   | Measured                   |                                   |
| Supporting Information: | See Appendix D - PGN 65254 |                                   |
| PGN reference:          | 65254                      |                                   |

**SPN 1602      Local hour offset**

The hour component of the offset between the UTC (Universal Time Coordinate) time and date and a local time zone time and date. This is the number of hours to add to UTC, a.k.a. GMT, time and date to convert to the time and date in the local time zone. This parameter indicates the time reference of the data reported in the Time and Date SPNs 959, 960, 961, 962, 963, and 964. The Local Offset is a positive value for time zones East of the Prime Meridian to the International Date Line. The Local Offset is a negative value for time zones West of the Prime Meridian to the International Date Line. The Local Hour Offset is only applicable when the Time and Date parameters are reported as UTC time and date.

**Recommended Settings:**

Applications should not use the \$FF 'Not Available' if using the Time and Date parameters due to some ambiguity of the time standard for the reported time and date values. The recommended settings for the Local Hour Offset settings are: If reporting the Time and Date as Local time, then Local Hour Offset must be reported as \$FA.

If reporting the Time and Date as UTC time and Local Hour Offset is not supported or not known, then Local Hour Offset must be reported as \$F9.

If reporting the Time and Date as UTC time and Local Hour Offset is known, then Local Hour Offset must be reported as a value between \$66 and \$94.

|                         |                            |                                 |
|-------------------------|----------------------------|---------------------------------|
| Data Length:            | 1 byte                     |                                 |
| Resolution:             | 1 hr/bit, -125 hr offset   |                                 |
| Data Range:             | -125 to 125 hr             | Operational Range: -23 to +23 h |
| Type:                   | Measured                   |                                 |
| Supporting Information: | See Appendix D - PGN 65254 |                                 |
| PGN reference:          | 65254                      |                                 |

**SPN 1603      *Adjust seconds***

The seconds component for setting the current time of day. This should be reported as the seconds component of the current time according to the time of day standard indicated with the Local Hour Offset parameter (SPN 1602). The time of day should be reported as the current time at UTC (Universal Time Coordinate), a.k.a. GMT; however, it may be reported as the current time at a local time zone. The Local Hour Offset parameter (SPN 1602) is used to indicate if the time of day (SPNs 959, 960, and 961) is the current UTC time or a local time zone time. Refer to SPN 1602 for details.

|                         |                            |                                 |
|-------------------------|----------------------------|---------------------------------|
| Data Length:            | 1 byte                     |                                 |
| Resolution:             | 0.25 s/bit, 0 offset       |                                 |
| Data Range:             | 0 to 62.5 s                | Operational Range: 0 to 59.75 s |
| Type:                   | Measured                   |                                 |
| Supporting Information: | See Appendix D - PGN 65254 |                                 |
| PGN reference:          | 54528                      |                                 |

**SPN 1604      *Adjust minutes***

The minutes component for setting the current time of day. This should be reported as the minutes component of the current time according to the time of day standard indicated with the Local Hour Offset parameter (SPN 1602). The time of day should be reported as the current time at UTC (Universal Time Coordinate), a.k.a. GMT; however, it may be reported as the current time at a local time zone. The Local Hour Offset parameter (SPN 1602) is used to indicate if the time of day (SPNs 959, 960, and 961) is the current UTC time or a local time zone time. Refer to SPN 1602 for details.

|                         |                            |                                |
|-------------------------|----------------------------|--------------------------------|
| Data Length:            | 1 byte                     |                                |
| Resolution:             | 1 min/bit, 0 offset        |                                |
| Data Range:             | 0 to 250 mins              | Operational Range: 0 to 59 min |
| Type:                   | Measured                   |                                |
| Supporting Information: | See Appendix D - PGN 65254 |                                |
| PGN reference:          | 54528                      |                                |

**SPN 1605      *Adjust hours***

The hours component for setting the current time of day. This should be reported as the hours component of the current time according to the time of day standard indicated with the Local Hour Offset parameter (SPN 1602). The time of day should be reported as the current time at UTC (Universal Time Coordinate), a.k.a. GMT; however, it may be reported as the current time at a local time zone. The Local Hour Offset parameter (SPN 1602) is used to indicate if the time of day (SPNs 959, 960, and 961) is the current UTC time or a local time zone time. Refer to SPN 1602 for details.

|                         |                            |                              |
|-------------------------|----------------------------|------------------------------|
| Data Length:            | 1 byte                     |                              |
| Resolution:             | 1 hr/bit, 0 offset         |                              |
| Data Range:             | 0 to 250 hr                | Operational Range: 0 to 23 h |
| Type:                   | Measured                   |                              |
| Supporting Information: | See Appendix D - PGN 65254 |                              |
| PGN reference:          | 54528                      |                              |

**SPN 1606      *Adjust month***

The month component for setting the current calendar date. This should be reported as the month component of the current date according to the calendar date standard indicated with the Local Hour Offset parameter (SPN 1602). The calendar date should be reported as the current date at UTC (Universal Time Coordinate), a.k.a. GMT; however, it may be reported as the current date at a local time zone. The Local Hour Offset parameter (SPN 1602) is used to indicate if the calendar date (SPNs 962, 963, and 964) is the current UTC date or a local time zone date. Refer to SPN 1602 for details.

NOTE - A value of 0 for the month is null. The value 1 identifies January; 2 identifies February; etc.

|                         |                            |                                  |
|-------------------------|----------------------------|----------------------------------|
| Data Length:            | 1 byte                     |                                  |
| Resolution:             | 1 month/bit, 0 offset      |                                  |
| Data Range:             | 0 to 250 months            | Operational Range: 1 to 12 month |
| Type:                   | Measured                   |                                  |
| Supporting Information: | See Appendix D - PGN 65254 |                                  |
| PGN reference:          | 54528                      |                                  |

**SPN 1607      *Adjust day***

The day component for setting the current calendar date. This should be reported as the day component of the current date according to the calendar date standard indicated with the Local Hour Offset parameter (SPN 1602). The calendar date should be reported as the current date at UTC (Universal Time Coordinate), a.k.a. GMT; however, it may be reported as the current date at a local time zone. The Local Hour Offset parameter (SPN 1602) is used to indicate if the calendar date (SPNs 962, 963, and 964) is the current UTC date or a local time zone date. Refer to SPN 1602 for details.

NOTE - A value of 0 for the date is null. The values 1, 2, 3, and 4 are used to identify the first day of the month; 5, 6, 7, and 8 identify the second day of the month; etc.

|                         |                            |                                      |
|-------------------------|----------------------------|--------------------------------------|
| Data Length:            | 1 byte                     |                                      |
| Resolution:             | 0.25 days/bit, 0 offset    |                                      |
| Data Range:             | 0 to 62.5 days             | Operational Range: 0.25 to 31.75 day |
| Type:                   | Measured                   |                                      |
| Supporting Information: | See Appendix D - PGN 65254 |                                      |
| PGN reference:          | 54528                      |                                      |

**SPN 1608      *Adjust year***

The year component for setting the current calendar date. This should be reported as the year component of the current date according to the calendar date standard indicated with the Local Hour Offset parameter (SPN 1602). The calendar date should be reported as the current date at UTC (Universal Time Coordinate), a.k.a. GMT; however, it may be reported as the current date at a local time zone. The Local Hour Offset parameter (SPN 1602) is used to indicate if the calendar date (SPNs 962, 963, and 964) is the current UTC date or a local time zone date. Refer to SPN 1602 for details.

NOTE - A value of 0 for the year identifies the year 1985; a value of 1 identifies 1986; etc.

|                         |                               |                                      |
|-------------------------|-------------------------------|--------------------------------------|
| Data Length:            | 1 byte                        |                                      |
| Resolution:             | 1 year/bit, 1985 years offset |                                      |
| Data Range:             | 1985 to 2235 years            | Operational Range: 1985 to 2235 year |
| Type:                   | Measured                      |                                      |
| Supporting Information: | See Appendix D - PGN 65254    |                                      |
| PGN reference:          | 54528                         |                                      |

**SPN 1609      *Adjust local minute offset***

The minute component for setting the offset between the UTC (Universal Time Coordinate) time and date and a the local time zone time and date. This is the number of minutes to add to UTC, a.k.a. GMT, time and date to convert to the time and date in the Local Time Zone. The Local Offset is a positive value for time zones East of the Prime Meridian to the International Date Line. The Local Offset is a negative value for time zones West of the Prime Meridian to the International Date Line.

The Local Minute Offset is only applicable when the Time and Date parameters are reported as UTC time and date. Refer to SPN 1602 for details.

|                         |                            |                                   |
|-------------------------|----------------------------|-----------------------------------|
| Data Length:            | 1 byte                     |                                   |
| Resolution:             | 1 min/bit, -125 min offset |                                   |
| Data Range:             | -125 to 125 mins           | Operational Range: -59 to +59 min |
| Type:                   | Measured                   |                                   |
| Supporting Information: | See Appendix D - PGN 65254 |                                   |
| PGN reference:          | 54528                      |                                   |

**SPN 1610      *Adjust local hour offset***

The hour component for setting the offset between the UTC (Universal Time Coordinate) time and date and a the local time zone time and date. This is the number of minutes to add to UTC, a.k.a. GMT, time and date to convert to the time and date in the Local Time Zone. The Local Offset is a positive value for time zones East of the Prime Meridian to the International Date Line. The Local Offset is a negative value for time zones West of the Prime Meridian to the International Date Line.

The Local Hour Offset is only applicable when the Time and Date parameters are reported as UTC time and date. Refer to SPN 1602 for details.

|                         |                            |                                 |
|-------------------------|----------------------------|---------------------------------|
| Data Length:            | 1 byte                     |                                 |
| Resolution:             | 1 hr/bit, -125 hr offset   |                                 |
| Data Range:             | -125 to 125 hr             | Operational Range: -24 to +23 h |
| Type:                   | Measured                   |                                 |
| Supporting Information: | See Appendix D - PGN 65254 |                                 |
| PGN reference:          | 54528                      |                                 |

**SPN 1611      *Vehicle motion***

Indicates whether motion of the vehicle is detected or not.

00 Vehicle motion not detected  
01 Vehicle motion detected  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65132                    |                                       |

**SPN 1612      Driver 1 working state**

State of work of the driver.

000 Rest - sleeping  
001 Driver available – short break  
010 Work – loading, unloading, working in an office  
011 Drive – behind wheel  
100-101 Reserved  
110 Error  
111 Not available

Data Length:            3 bits  
Resolution:            8 states/3 bit, 0 offset  
Data Range:            0 to 7  
Type:                    Status  
Supporting Information:  
PGN reference:        65132

Operational Range: same as data range

**SPN 1613      Driver 2 working state**

State of work of the driver.

000 Rest - sleeping  
001 Driver available – short break  
010 Work – loading, unloading, working in an office  
011 Drive – behind wheel  
100-101 Reserved  
110 Error  
111 Not available

Data Length:            3 bits  
Resolution:            8 states/3 bit, 0 offset  
Data Range:            0 to 7  
Type:                    Status  
Supporting Information:  
PGN reference:        65132

Operational Range: same as data range

**SPN 1614      Vehicle Overspeed**

Indicates whether the vehicle is exceeding the legal speed limit set in the tachograph.

00 No overspeed  
01 Overspeed  
10 Error  
11 Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65132

Operational Range: same as data range

**SPN 1615      Driver card, driver 1**

Indicates the presence of a driver card

00 - Driver card not present  
01 - Driver card present  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65132

Operational Range: same as data range

**SPN 1616      Driver card, driver 2**

Indicates the presence of a driver card

00 - Driver card not present  
01 - Driver card present  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65132

Operational Range: same as data range

**SPN 1617      Driver 1 Time Related States**

Indicates if the driver approaches or exceeds working time limits (or other limits).

0000 Normal/No limits reached  
0001 Limit #1 – 15 min before 4 ½ h  
0010 Limit #2 – 4 ½ h reached  
0011 Limit #3 – 15 min before 9 h  
0100 Limit #4 – 9 h reached  
0101 Limit #5 – 15 min before 16 h (not having 8h rest during the last 24h)  
0110 Limit #6 – 16 h reached  
0111-1100 Reserved  
1101 Other  
1110 Error  
1111 Not available

Data Length:            4 bits  
Resolution:            16 states/4 bit, 0 offset  
Data Range:            0 to 15  
Type:                    Measured  
Supporting Information:  
PGN reference:        65132

Operational Range: same as data range



**SPN 1618      Driver 2 Time Related States**

Indicates if the driver approaches or exceeds working time limits (or other limits).

0000 Normal/No limits reached  
0001 Limit #1 – 15 min before 4 ½ h  
0010 Limit #2 – 4 ½ h reached  
0011 Limit #3 – 15 min before 9 h  
0100 Limit #4 – 9 h reached  
0101 Limit #5 – 15 min before 16 h (not having 8h rest during the last 24h)  
0110 Limit #6 – 16 h reached  
0111-1100 Reserved  
1101 Other  
1110 Error  
1111 Not available

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 65132                     |                                       |

**SPN 1619      Direction indicator**

Indicates the direction of the vehicle.

00 - Forward  
01 - Reverse  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65132                    |                                       |

**SPN 1620      Tachograph performance**

Indicates the tachograph performance; including electronic or mechanical analysis, instrument analysis, speed sensor analysis, mass storage analysis, and printer analysis.

00 - Normal performance  
01 - Performance analysis  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65132

Operational Range: same as data range

**SPN 1621      Handling information**

Indicates that handling information is present. Information could include “no printer paper”, “no driver card”, etc.

00 - No handling information  
01 - Handling information  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65132

Operational Range: same as data range

**SPN 1622      System event**

Indicates that a tachograph event has occurred. This may include power supply interruption, interruption of the speed sensor, incorrect data on the driver card, driving without a driver card, illegal removal of a driver card, insertion of a driver card during driving, and time adjustment.

00 - No tachograph event  
01 - Tachograph event  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65132

Operational Range: same as data range

**SPN 1623      Tachograph output shaft speed**

Calculated speed of the transmission output shaft.

|                         |                         |                                       |
|-------------------------|-------------------------|---------------------------------------|
| Data Length:            | 2 bytes                 |                                       |
| Resolution:             | 0.125 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 8,031.875 rpm      | Operational Range: same as data range |
| Type:                   | Measured                |                                       |
| Supporting Information: |                         |                                       |
| PGN reference:          | 65132                   |                                       |

**SPN 1624      Tachograph vehicle speed**

Speed of the vehicle registered by the tachograph.

|                         |                              |                                       |
|-------------------------|------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                      |                                       |
| Resolution:             | 1/256 km/h per bit, 0 offset |                                       |
| Data Range:             | 0 to 250.996 km/h            | Operational Range: same as data range |
| Type:                   | Measured                     |                                       |
| Supporting Information: |                              |                                       |
| PGN reference:          | 65132                        |                                       |

**SPN 1625      Driver 1 identification**

Used to obtain the driver identity.

|                         |                                                            |                                       |
|-------------------------|------------------------------------------------------------|---------------------------------------|
| Data Length:            | Variable - up to 1728 bytes followed by an "***" delimiter |                                       |
| Resolution:             | ASCII, 0 offset                                            |                                       |
| Data Range:             | 0 to 255 per byte                                          | Operational Range: same as data range |
| Type:                   | Measured                                                   |                                       |
| Supporting Information: |                                                            |                                       |
| PGN reference:          | 65131                                                      |                                       |

**SPN 1626      Driver 2 identification**

Used to obtain the driver identity.

|                         |                                                            |                                       |
|-------------------------|------------------------------------------------------------|---------------------------------------|
| Data Length:            | Variable - up to 1728 bytes followed by an "***" delimiter |                                       |
| Resolution:             | ASCII, 0 offset                                            |                                       |
| Data Range:             | 0 to 255 per byte                                          | Operational Range: same as data range |
| Type:                   | Measured                                                   |                                       |
| Supporting Information: |                                                            |                                       |
| PGN reference:          | 65131                                                      |                                       |

**SPN 1632      Engine Torque Limit Feature**

Torque limit rating described in the current record.

000 Reserved  
001 Highest torque rating  
010 First torque rating  
011 Previous torque rating (rating prior to the current rating)  
100 Current torque rating  
101-110 Reserved  
111 Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 3 bits                   |                                       |
| Resolution:             | 8 states/3 bit, 0 offset |                                       |
| Data Range:             | 0 to 7                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65168                    |                                       |

**SPN 1633      Cruise Control Pause Switch**

Switch signal which indicates the position of the Cruise Control Pause Switch used on Remote Cruise Control applications. The Cruise Control Pause Switch signal temporarily disables the Cruise Control function.

00 - Off  
01 - On  
10 - Error Indicator  
11 -Take No Action

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65265                    |                                       |

**SPN 1636      Engine Intake Manifold 1 Air Temperature (High Resolution)**

Temperature of pre-combustion air found in intake manifold of engine air supply system. The higher resolution is required for control purposes.

|                         |                                      |                                       |
|-------------------------|--------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                              |                                       |
| Resolution:             | 0.03125 deg C/bit, -273 deg C offset |                                       |
| Data Range:             | -273 to 1734.96875 deg C             | Operational Range: same as data range |
| Type:                   | Measured                             |                                       |
| Supporting Information: |                                      |                                       |
| PGN reference:          | 65129                                |                                       |

**SPN 1637      Engine Coolant Temperature (High Resolution)**

Temperature of liquid found in engine cooling system. The higher resolution is required for control purposes.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65129

**SPN 1638      Hydraulic Temperature**

Temperature of hydraulic fluid.

Data Length: 1 byte  
Resolution: 1 deg C/bit, -40 deg C offset  
Data Range: -40 to 210 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65128

**SPN 1639      Fan Speed**

The speed of the fan associated with engine coolant system.

Data Length: 2 bytes  
Resolution: 0.125 rpm/bit, 0 offset  
Data Range: 0 to 8,031.875 rpm      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65213

**SPN 1653      Vehicle Limiting Speed Governor Enable Switch**

Switch signal which enables the Vehicle Limiting Speed Governor (VLSG) such that the vehicle speed may be either increased or decreased when the engine is off idle.

00 - Switch disabled  
01 - Switched enabled  
10 - Error  
11 - Not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 57344

**SPN 1654      Vehicle Limiting Speed Governor Increment Switch**

Switch signal which increases the Vehicle Limiting Speed Governor (VLSG).

00 - Switch in the off state  
01 - Switch in the on state - increase  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 57344                    |                                       |

**SPN 1655      Vehicle Limiting Speed Governor Decrement Switch**

Switch signal which decreases the Vehicle Limiting Speed Governor (VLSG).

00 - Switch in the off state  
01 - Switch in the on state - decrease  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 57344                    |                                       |

**SPN 1656      Engine Automatic Start Enable Switch**

Switch signal which enables the idle management system to be enabled. When this system is enabled with the engine in an idle mode and safe operating conditions existing, then the engine may be started or stopped automatically.

00 - Switch in the off state  
01 - Switch in the on state  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 57344                    |                                       |

**SPN 1665      Engine Turbocharger Oil Level Switch**

Switch signal which indicates the presence of oil at the turbocharger

00 = No oil present at turbocharger  
01 = Oil present at turbocharger  
10 = Error  
11 = Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65245

Operational Range: same as data range

**SPN 1666      Automatic Gear Shifting Enable Switch**

Indicates that automated gear shifting is enabled via a switch

00 = Automated Gear Shifting is disabled  
01 = Automated Gear Shifting is enabled  
10 = Error  
11 = Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        57344

Operational Range: same as data range

**SPN 1667      Retarder Requesting Brake Light**

Indicates that whether the retarder is requesting that the brake lights are illuminated.

00 - Retarder is not requesting that the brake lights are illuminated  
01 - Retarder is requesting that the brake lights are illuminated  
10 - Reserved  
11 - Not available/Take no action

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        61440

Operational Range: same as data range

**SPN 1675      Engine Starter Mode**

There are several phases in a starting action and different reasons why a start cannot take place.

0000 start not requested  
0001 starter active, gear not engaged  
0010 starter active, gear engaged  
0011 start finished; starter not active after having been actively engaged (after 50ms mode goes to 0000)  
0100 starter inhibited due to engine already running  
0101 starter inhibited due to engine not ready for start (preheating)  
0110 starter inhibited due to driveline engaged or other transmission inhibit  
0111 starter inhibited due to active immobilizer  
1000 starter inhibited due to starter over-temp  
1001-1011 Reserved  
1100 starter inhibited - reason unknown  
1101 error (legacy implementation only, use 1110)  
1110 error  
1111 not available

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 61444                     |                                       |

**SPN 1676      Auxiliary Heater Water Pump Status**

Parameter indicating whether the auxiliary heater water pump is running

00 Water Pump is not running  
01 Water Pump is running  
10 Reserved  
11 Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65133                    |                                       |



**SPN 1677      Auxiliary Heater Mode**

State of the auxiliary heater

0000 Heater not active  
0001 Off due to ADR per European Regulations for Transport of hazardous materials  
0010 Economy mode  
0011 Normal mode  
0100-1101 Not defined  
1110 Error  
1111 Not available

Data Length:            4 bits  
Resolution:            16 states/4 bit, 0 offset  
Data Range:            0 to 15  
Type:                    Status  
Supporting Information:  
PGN reference:        65133

Operational Range: same as data range

**SPN 1678      Cab Ventilation**

Indicates whether the cab is being ventilated or not.

00 Cab not ventilated  
01 Cab is ventilated  
10 Reserved  
11 Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65133

Operational Range: same as data range

**SPN 1679      Engine Heating Zone**

Parameter indicating whether the engine zone is being heated.

00 Engine heating zone off  
01 Engine heating zone on  
10 Reserved  
11 Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65133

Operational Range: same as data range

**SPN 1680 Cab Heating Zone**

Parameter indicating whether the cab zone is being heated.

00 Cab heating zone off  
01 Cab heating zone on  
10 Reserved  
11 Not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 65133

Operational Range: same as data range

**SPN 1681 Battery Main Switch Hold State**

Parameter indicating whether the battery main switch is held due to an external request or not. The state battery main switch held indicates that the battery main switch is about to switch off.

00 Battery main switch not held  
01 Battery main switch held  
10 Reserved  
11 Don't care/take no action

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 65126

Operational Range: same as data range

**SPN 1682 Battery Main Switch Hold Request**

Request to hold the battery main switch.

00 Release Battery Main Switch  
01 Hold Battery Main Switch  
10 undefined  
11 Don't care/take no action

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 57344

Operational Range: same as data range

**SPN 1683      Auxiliary Heater Mode Request**

Request to activate the auxiliary heater.

0000 De-activate auxiliary heater  
0001 Off due to ADR per European Regulations for Transport of hazardous materials  
0010 Economy mode  
0011 Normal mode  
0100-1101 Not defined  
1110 Reserved  
1111 Don't care/take no action

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 57344                     |                                       |

**SPN 1684      Auxiliary Heater Coolant Pump Request**

Indicates whether to activate the auxiliary heater coolant water pump.

00 Deactivate water pump  
01 Activate water pump  
10 Reserved  
11 Don't care/take no action

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 57344                    |                                       |

**SPN 1685      Request Engine Zone Heating**

Request to activate engine zone heating.

00 Do not heat engine zone  
01 Heat engine zone  
10 Reserved  
11 Don't care/take no action

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 57344                    |                                       |

**SPN 1686      Request Cab Zone Heating**

Request to activate cab zone heating.

00 Do not cab engine zone  
01 Heat cab zone  
10 Reserved  
11 Don't care/take no action

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 57344                    |                                       |

**SPN 1687      Auxiliary Heater Output Coolant Temperature**

Temperature of the auxiliary heater output coolant (I.e. water in a water heater system.)

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 deg C/bit, -40 deg C offset |                                       |
| Data Range:             | -40 to 210 deg C              | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          | 65133                         |                                       |

**SPN 1688      Auxiliary Heater Input Air Temperature**

Temperature of the input air in an auxiliary heater system.

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 deg C/bit, -40 deg C offset |                                       |
| Data Range:             | -40 to 210 deg C              | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          | 65133                         |                                       |

**SPN 1689      Auxiliary Heater Output Power Percent**

Current auxiliary heater output power, relative to the auxiliary heater maximum output power.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65133               |                                       |

**SPN 1690      Auxiliary Heater Maximum Output Power**

The maximum output power of the auxiliary heater.

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 2 bytes           |                                       |
| Resolution:             | 2 W/bit, 0 offset |                                       |
| Data Range:             | 0 to 128,510 W    | Operational Range: same as data range |
| Type:                   | Measured          |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 65127             |                                       |

**SPN 1691      Cab Interior Temperature Command**

Parameter used to command a certain cab interior temperature.

Note: See also SPN 170. SPN 1662 is an additional diagnostic SPN associated with cab temperature.

|                         |                                      |                                       |
|-------------------------|--------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                              |                                       |
| Resolution:             | 0.03125 deg C/bit, -273 deg C offset |                                       |
| Data Range:             | -273 to 1734.96875 deg C             | Operational Range: same as data range |
| Type:                   | Status                               |                                       |
| Supporting Information: |                                      |                                       |
| PGN reference:          | 57344                                |                                       |

**SPN 1692      Engine Desired Absolute Intake Manifold Pressure (Turbo Boost Limit)**

The desired absolute intake manifold pressure of the engine.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Status                |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65194                 |                                       |

**SPN 1693      Engine Turbocharger Wastegate Valve Position**

The position of the turbocharger wastegate valve (not the electronic wastegate control valve).

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65194               |                                       |

**SPN 1694      Engine Gas Mass Flow Sensor Fueling Correction**

The amount of fuel the Gas Mass Flow Sensor is sensing should be added or subtracted compared to the maximum amount of fuel the control system allows the sensor to add or subtract.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 1 %/bit, -125 % offset |                                       |
| Data Range:             | -125 to 125 %          | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65194                  |                                       |

**SPN 1695      Engine Exhaust Gas Oxygen Sensor Fueling Correction**

The amount of fueling change required by the system based on the measured Exhaust Oxygen value compared to the maximum fueling change permitted by the system, expressed as percentages.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 1 %/bit, -125 % offset |                                       |
| Data Range:             | -125 to 125 %          | Operational Range: same as data range |
| Type:                   | Status                 |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65193                  |                                       |

**SPN 1696      Engine Exhaust Gas Oxygen Sensor Closed Loop Operation**

Indicates whether the engine is using the Exhaust Gas Oxygen sensor to control the air/fuel ratio.

00 Engine not using the Exhaust Gas Oxygen sensor (open loop)  
01 Engine using the Exhaust Gas Oxygen sensor for a closed loop operation  
10 Reserved  
11 Don't Care/take no action

See also SPN 4240 for an implementation with more states.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65193                    |                                       |

**SPN 1697      CTI Wheel End Electrical Fault**

Indicates the status of electrical fault on CTI wheel interface.

00 Ok ( No Fault)  
01 Not Defined  
10 Error  
11 Not Supported

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65268

Operational Range: same as data range

**SPN 1698      CTI Tire Status**

Indicates the status of the tire.

00 Ok (no fault)  
01 Tire leak detected  
10 Error  
11 Not Supported

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65268

Operational Range: same as data range

**SPN 1699      CTI Wheel Sensor Status**

Indicates whether the wheel is being monitored by the CTI controller.

00 Off / isolated from CTI Pressure Controller  
01 On (tire is polled)  
10 Not Defined  
11 Not Supported

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65268

Operational Range: same as data range

**SPN 1700      Lane Departure Imminent, Left Side**

Indicates departure imminent on left side of lane.

00 Not imminent  
01 Imminent  
10 Reserved  
11 Not used

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        61447

Operational Range: same as data range

**SPN 1701      Lane Departure Imminent, Right Side**

Indicates departure imminent on right side of lane.

00 Not imminent  
01 Imminent  
10 Reserved  
11 Not Used

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        61447

Operational Range: same as data range

**SPN 1702      Lane Departure Indication Enable Status**

Indicates whether lane departure indication is active.

00 Lane Departure indication disabled  
01 Lane Departure Indication enabled  
10 Reserved  
11 Not Used

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65115

Operational Range: same as data range



**SPN 1710      Lane Tracking Status Left Side**

Indicates whether the left side is tracking lane.

00 Not Tracking Left side  
01 Tracking Left side  
10 Reserved  
11 Don't care/Take no action

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65115

Operational Range: same as data range

**SPN 1711      Lane Tracking Status Right Side**

Indicates whether right side is tracking lane.

00 Not Tracking Right side  
01 Tracking Right side  
10 Reserved  
11 Don't Care/take no action

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65115

Operational Range: same as data range

**SPN 1712      Engine Extended Range Requested Speed Control Range Upper Limit (Engine configuration)**

The maximum engine speed regardless of load that the engine will allow when operating in a speed control/limit mode, excluding any maximum momentary engine override speed, if supported.

When the limit is higher than 2500 RPM the 'Requested Speed Control Range Upper Limit (Engine Configuration)' parameter (see SPN 536) will be transmitted with a value of 2500 RPM.

Data Length:            2 bytes  
Resolution:            0.125 rpm/bit, 0 offset  
Data Range:            0 to 8,031.875 rpm  
Type:                    Measured  
Supporting Information:  
PGN reference:        65251

Operational Range: same as data range

**SPN 1713      Hydraulic Oil Filter Restriction Switch**

This switch indicates whether hydraulic oil filter is clogged. This is not the transmission oil filter restriction switch, which is SPN 3359.

00 No restriction  
01 Restriction exists on oil filter  
10 Error  
11 Not Available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 65128

Operational Range: same as data range

**SPN 1714      Operator Seat Direction Switch**

Senses whether the operator seat is in the forward driving position

00 Operator seat not facing forward  
01 Operator seat is facing forward  
10 Error  
11 Not Available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 57344

Operational Range: same as data range

**SPN 1715      Drivers Demand Retarder - Percent Torque**

The Drivers demand retarder – percent torque is the maximum torque selected by the driver when one or more modes are selected by the driver, such as hand lever, switch, constant torque, constant velocity, etc.

Data Length: 1 byte  
Resolution: 1 %/bit, -125 % offset  
Data Range: -125 to 125 %  
Type: Status  
Supporting Information:  
PGN reference: 61440

Operational Range: -125% to 0%

**SPN 1716      Retarder Selection, non-engine**

The "Retarder Selection, non-engine" is the position of the driver's selector for retarders that are not part of the engine system, expressed as percent and determined by the ratio of current position to the maximum possible position. The physical device may be a lever, rotary dial, combination of switches, or other device that the driver can use to select the type or amount of retardation needed.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 61440               |                                       |

**SPN 1717      Actual Maximum Available Retarder - Percent Torque**

This is the maximum amount of torque that the retarder can immediately deliver. It is the same as the maximum torque shown in the Retarder's Configuration message, but allows for a much faster rate of change than could be communicated by reissuing the configuration message.

Application Note: The purpose for this parameter is to allow a "Master" retarder controller to more accurately allocate the vehicle's retarder requirements among multiple retarders. Its value should be the same as the value in the Configuration message at the time that message is assembled for broadcast, but may vary between those broadcasts.

|                         |                        |                                |
|-------------------------|------------------------|--------------------------------|
| Data Length:            | 1 byte                 |                                |
| Resolution:             | 1 %/bit, -125 % offset |                                |
| Data Range:             | -125 to 125 %          | Operational Range: -125 % to 0 |
| Type:                   | Measured               |                                |
| Supporting Information: |                        |                                |
| PGN reference:          | 61440                  |                                |

**SPN 1718      Damper Stiffness Request Front Axle**

Demand value for the shock absorber control at the front axle.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Status              |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 53760               |                                       |

**SPN 1719      Damper Stiffness Request Rear Axle**

Demand value for the shock absorber control at the rear axle.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Status              |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 53760               |                                       |

**SPN 1720      *Damper Stiffness Request Lift / Tag Axle***

Demand value for the shock absorber control at the lift or tag axle

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Status              |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 53760               |                                       |

**SPN 1721      *Relative Level Front Axle Left***

Information of the height at the left side of the front axle referred to normal level 1. For explanations of normal level 1 see SPN 1734 - Nominal Level Front Axle.

|                         |                              |                                       |
|-------------------------|------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                      |                                       |
| Resolution:             | 0.1 mm/bit, -3,200 mm offset |                                       |
| Data Range:             | -3,200 to 3,225.5 mm         | Operational Range: same as data range |
| Type:                   | Measured                     |                                       |
| Supporting Information: |                              |                                       |
| PGN reference:          | 65113                        |                                       |

**SPN 1722      *Relative Level Front Axle Right***

Information of the height at the right side of the front axle referred to normal level 1. For explanations of normal level 1 see SPN 1734 - Nominal Level Front Axle.

|                         |                              |                                       |
|-------------------------|------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                      |                                       |
| Resolution:             | 0.1 mm/bit, -3,200 mm offset |                                       |
| Data Range:             | -3,200 to 3,225.5 mm         | Operational Range: same as data range |
| Type:                   | Measured                     |                                       |
| Supporting Information: |                              |                                       |
| PGN reference:          | 65113                        |                                       |

**SPN 1723      *Relative Level Rear Axle Right***

Information of the height at the left side of the rear axle referred to normal level 1. For explanations of normal level 1 see parameter SPN 1734 - Nominal Level Front Axle.

|                         |                              |                                       |
|-------------------------|------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                      |                                       |
| Resolution:             | 0.1 mm/bit, -3,200 mm offset |                                       |
| Data Range:             | -3,200 to 3,225.5 mm         | Operational Range: same as data range |
| Type:                   | Measured                     |                                       |
| Supporting Information: |                              |                                       |
| PGN reference:          | 65113                        |                                       |

**SPN 1724      *Relative Level Rear Axle Left***

Information of the height at the left side of the rear axle referred to normal level 1. For explanations of normal level 1 see parameter SPN 1734 - Nominal Level Front Axle.

|                         |                              |                                       |
|-------------------------|------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                      |                                       |
| Resolution:             | 0.1 mm/bit, -3,200 mm offset |                                       |
| Data Range:             | -3,200 to 3,225.5 mm         | Operational Range: same as data range |
| Type:                   | Measured                     |                                       |
| Supporting Information: |                              |                                       |
| PGN reference:          | 65113                        |                                       |

**SPN 1725      *Bellow Pressure Front Axle Left***

Information of the pressure of the air suspension bellow at the left side of the front axle

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65112                 |                                       |

**SPN 1726      *Bellow Pressure Front Axle Right***

Information of the pressure of the air suspension bellow at the right side of the front axle

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65112                 |                                       |

**SPN 1727      *Bellow Pressure Rear Axle Left***

Information of the pressure of the air suspension bellow at the left side of the rear axle

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65112                 |                                       |

**SPN 1728      Bellow Pressure Rear Axle Right**

Information of the pressure of the air suspension bellow at the right side of the rear axle

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65112                 |                                       |

**SPN 1729      Damper Stiffness Front Axle**

Damper stiffness information of the shock absorber control at the front axle

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Status              |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65111               |                                       |

**SPN 1730      Damper Stiffness Rear Axle**

Damper stiffness information of the shock absorber control at the rear axle

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Status              |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65111               |                                       |

**SPN 1731      Damper Stiffness Lift / Tag Axle**

Damper stiffness information of the shock absorber control at the lift of tag axle

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Status              |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65111               |                                       |

**SPN 1732      Level Preset Front Axle Left**

Set value for nominal level 'preset level' at the left side of the front axle. This value is referred to 'Normal level 1'. For explanations of normal level 1 see parameter SPN 1734 - Nominal Level Front Axle.

|                         |                              |                                       |
|-------------------------|------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                      |                                       |
| Resolution:             | 0.1 mm/bit, -3,200 mm offset |                                       |
| Data Range:             | -3,200 to 3,225.5 mm         | Operational Range: same as data range |
| Type:                   | Status                       |                                       |
| Supporting Information: |                              |                                       |
| PGN reference:          | 53504                        |                                       |

**(R) SPN 1733      Nominal Level Rear Axle**

Signal which indicates the nominal (desired) height of the rear axle to be controlled by the suspension system.

For further explanations see SPN 1734 - Nominal Level Front Axle.

0000 Level not specified,(i.e. the nominal level is none of the specified levels, no error condition)  
0001 "Normal Level 1,(i.e. the level prescribed for normal driving, given by design)  
0010 "Normal Level 2,(i.e. a level permitted for driving, for example to lower the vehicle in case of high speed)  
0011 "Normal Level 3,(i.e. a level permitted for driving, for example to lift the vehicle in case of offroad)  
0100 "Preset Level,(i.e. a level to be defined externally via CAN)  
0101 "Customer Level,(i.e. a level to be defined by customer via parameter setting)  
0110 "Upper Level,(i.e. the highest level to be controlled)  
0111 "Lower Level,(i.e. the lowest level to be controlled)  
1000 Not defined  
1001 Raising  
1010 Lowering  
1011-1101 Not defined  
1110 Error  
1111 Not available

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 65114                     |                                       |

**(R) SPN 1734      Nominal Level Front Axle**

Signal which indicates the nominal (desired) height of the front axle to be controlled by the suspension system.

These heights are discrete levels. They are the upper level, lower level, normal level 1, normal level 2, normal level 3, customer level, and preset level. Refer to Figure SPN1734\_A.

- Upper Level is the highest mechanically available height of the vehicle.
- Lower Level is the lowest mechanically available height of the vehicle.

Normal Levels 1, 2 and 3 are heights normally used during driving.

- Normal Level 1 is most often used and is given by design.
- Normal Level 2 may be chosen, for example, to be lower than Normal Level 1 for the purpose of reducing fuel consumption while driving on highways.
- Normal Level 3 may be chosen above Normal Level 1 for driving off road.

The preset level has to be set by means of ASC 6 (PGN: 53504).

States 'Raising' and 'Lowering' are only active when corresponding states are requested in SPN 1751. This provides the possibility to adjust vehicle to a level other than the predefined levels.

0000 Level not specified,(i.e. the nominal level is none of the specified levels, no error condition)  
0001 "Normal Level 1,(i.e. the level prescribed for normal driving, given by design)  
0010 "Normal Level 2,(i.e. a level permitted for driving, for example to lower the vehicle in case of high speed)  
0011 "Normal Level 3,(i.e. a level permitted for driving, for example to lift the vehicle in case of offroad)  
0100 "Preset Level,(i.e. a level to be defined externally via CAN)  
0101 "Customer Level,(i.e. a level to be defined by customer via parameter setting)  
0110 "Upper Level,(i.e. the highest level to be controlled)  
0111 "Lower Level,(i.e. the lowest level to be controlled)  
1000 Not defined  
1001 Raising  
1010 Lowering  
1011-1101 Not defined  
1110 Error  
1111 Not available

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: | See Appendix D - SPN 1734 |                                       |
| PGN reference:          | 65114                     |                                       |

**SPN 1735      Level Preset Rear Axle Right**

Set value for nominal level 'preset level' at the right side of the rear axle. This value is referred to 'Normal level 1'. For explanations of normal level 1 see SPN 1734 - Nominal Level Front Axle.

|                         |                              |                                       |
|-------------------------|------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                      |                                       |
| Resolution:             | 0.1 mm/bit, -3,200 mm offset |                                       |
| Data Range:             | -3,200 to 3,225.5 mm         | Operational Range: same as data range |
| Type:                   | Status                       |                                       |
| Supporting Information: |                              |                                       |
| PGN reference:          | 53504                        |                                       |



**SPN 1736      *Above Nominal Level Rear Axle***

Signal which indicates whether the actual height of the rear axle is above the nominal (desired) level of the rear axle. For explanations of nominal level see parameter SPN 1734 - Nominal Level Front Axle.

00 Not above  
01 Above  
10 Error  
11 Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65114

Operational Range: same as data range

**SPN 1737      *Above Nominal Level Front Axle***

Signal which indicates whether the actual height of the front axle is above the nominal (desired) level of the front axle. For explanations of nominal level see SPN 1734 - Nominal Level Front Axle.

00 Not above  
01 Above  
10 Error  
11 Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65114

Operational Range: same as data range

**SPN 1738      *Below Nominal Level Front Axle***

Signal which indicates whether the actual height of the front axle is below the nominal (desired) level for the front axle. For explanations of nominal level see parameter SPN 1734 - Nominal Level Front Axle.

00 Not below  
01 Below  
10 Error  
11 Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65114

Operational Range: same as data range

**SPN 1739      *Lifting Control Mode Front Axle***

Signal which indicates the actual lifting level change at the front axle

00 Lifting not active  
01 Lifting active  
10 Error  
11 Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65114

Operational Range: same as data range

**SPN 1740      *Lowering Control Mode Front Axle***

Signal which indicates the actual lowering level change at the front axle

00 Lowering not active  
01 Lowering active  
10 Error  
11 Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65114

Operational Range: same as data range

**(R) SPN 1741      Level Control Mode**

Signal which indicates the actual control mode of the air suspension system

0000 Normal operation; i.e. the system performs a ""pure"" control of the vehicle height  
0001 Traction help (load transfer); i.e. the driven axle is loaded to a maximum value given by legislation or design  
0010 Load fixing; i.e. the driven axlen is loaded to a value defined by the driver  
0011 Pressure ratio 1; i.e. the ratio between the pressures at the driven axle and at the third axle is controlled, so that the ratio equals a fixed value 1  
0100 Pressure ratio 2; i.e. the ratio between the pressures at the driven axle and at the third axle is controlled, so that the ratio equals a fixed value 2  
0101 Optimum traction 1; i.e. the pressure at the driven axle is controlled at a fixed value 1  
0110 Optimum traction 2; i.e. the pressure at the driven axle is controlled at a fixed value 2  
0111 Traction help - load reduce; (i.e. the driven axle load is reduced to normal load condition)  
1000 Exhausting bellow function; i.e. the bellows are exhausted totally  
1001 Air suspension control prohibited ( i.e. hold current pressures in all suspension devices.)  
1010 Automatic air suspension control prohibited  
1011-1101 Not defined  
1110 Error  
1111 Not available

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 65114                     |                                       |

**SPN 1742      Kneeling Information**

Signal which indicates the actual level change in case of kneeling function

0000 Not active,(i.e. the kneeling function is not active")  
0001Lowering active,(i.e. the vehicle is lowered due to a kneeling request)  
0010 Kneeling level reached,(i.e. the vehicle is at the fixed kneeling level)  
0011 Lifting active,(i.e. the vehicle is lifted due to a recover request)  
0100 Kneeling aborted,(i.e. in case of manual actuation the request was dropped before the kneeling level was reached)  
0101-1101 Not defined  
1110 Error  
1111 Not available

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 65114                     |                                       |

**SPN 1743      *Lift Axle 1 Position***

Signal which indicates the position / load condition of lift axle / tag axle #1. Numbering of lift/tag axles starts at front axle.

00 Lift axle position down / tag axle laden  
01 Lift axle position up / tag axle unladen  
10 Error  
11 Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65114

Operational Range: same as data range

**SPN 1744      *Door Release***

Signal which indicates that the doors may be opened. [Please note: doors instead of door!]  
In case a kneeling request is active the ASC indicates during lowering the vehicle "doors shall not be opened" as a security information until the kneeling level is reached. Then "doors may be opened" is sent.

00 Doors may not be opened  
01 Doors may be opened  
10 Error  
11 Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65114

Operational Range: same as data range

**SPN 1745      *Vehicle Motion Inhibit***

Signal which indicates whether vehicle motion is inhibited.

00 Vehicle may be moved  
01 Vehicle motion is inhibited  
10 Error  
11 Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65114

Operational Range: same as data range

**SPN 1746      Security Device**

The signal which indicates the status of the security device. An example of a security device is a curbstone feeler installed beneath the doors of a bus. If the security device becomes active during kneeling the kneeling process (lowering) is stopped and the vehicle lifts back to the starting level.

00 Not active  
01 Active  
10 Error  
11 Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65114

Operational Range: same as data range

**SPN 1747      Kneeling Control Mode Request**

Command signal to select the kneeling functionality

00 Automatically actuated  
01 Manually actuated  
10 Reserved  
11 Don't care/take no action

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        53760

Operational Range: same as data range

**SPN 1748      Kneeling Request Right Side**

Command signal to activate the kneeling functionality on the right side of the vehicle

00 No kneeling request  
01 Kneeling request  
10 Reserved  
11 Don't care/take no action

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        53760

Operational Range: same as data range

**SPN 1749      *Kneeling Request Left Side***

Command signal to activate the kneeling functionality on the left side of the vehicle

00 No kneeling request  
01 Kneeling request  
10 Reserved  
11 Don't care/take no action

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        53760

Operational Range: same as data range

**(R) SPN 1750      *Nominal Level Request Rear Axle***

Command signal to activate a level of the rear axle programmed and/or memorized in the ECU. For explanations of nominal level see SPN 1734 - Nominal Level Front Axle.

0000 No level request  
0001 Normal Level 1,(i.e. the level prescribed for normal driving, given by design)  
0010 Normal Level 2,(i.e. a level permitted for driving, for example to lower the vehicle in case of high speed)  
0011 Normal Level 3,(i.e. a level permitted for driving, for example to lift the vehicle in case of offroad)  
0100 Preset Level,(i.e. a level to be defined externally via CAN)  
0101 Customer Level,(i.e. a level to be defined by customer via parameter setting)  
0110 Upper Level,(i.e. the highest level to be controlled)  
0111 Lower Level,(i.e. the lowest level to be controlled)  
1000 Stop level change,(i.e. the level change in process shall be stopped immediately)  
1001 Raise Request (Continuously raising front axle, as long as active).  
1010 Lower Request (Continuously lowering front axle, as long as active).  
1011-1101 Not defined  
1110 Reserved  
1111 Don't care/take no action

Data Length:            4 bits  
Resolution:            16 states/4 bit, 0 offset  
Data Range:            0 to 15  
Type:                    Status  
Supporting Information:  
PGN reference:        53760

Operational Range: same as data range

**(R) SPN 1751      Nominal Level Request Front Axle**

Command signal to activate a level of the front axle programmed and/or memorized in the ECU For explanations of nominal level see SPN 1734 - Nominal Level Front Axle.

0000 No level request  
0001 Normal Level 1,(i.e. the level prescribed for normal driving, given by design)  
0010 Normal Level 2,(i.e. a level permitted for driving, for example to lower the vehicle in case of high speed)  
0011 Normal Level 3,(i.e. a level permitted for driving, for example to lift the vehicle in case of offroad)  
0100 Preset Level,(i.e. a level to be defined externally via CAN)  
0101 Customer Level,(i.e. a level to be defined by customer via parameter setting)  
0110 Upper Level,(i.e. the highest level to be controlled)  
0111 Lower Level,(i.e. the lowest level to be controlled)  
1000 Stop level change,(i.e. the level change in process shall be stopped immediately)  
1001 Raise Request (Continuously raising front axle, as long as active).  
1010 Lower Request (Continuously lowering front axle, as long as active).  
1011-1101 Not defined  
1110 Reserved  
1111 Don't care/take no action

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 53760                     |                                       |

**SPN 1752      Lift Axle 1 Position Command**

Signal to command the position/load condition of lift/tag axle #1. Numbering of lift/tag axles starts at front axle.

00 Lift axle position down / tag axle laden  
01 Lift axle position up / tag axle unladen  
10 Reserved  
11 Don't care/take no action

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 53760                    |                                       |

**SPN 1753      Level Control Mode Request**

Command signal to activate a level control mode

0000 Normal operation; i.e. the system performs a ""pure"" control of the vehicle height  
0001 Traction help (load transfer); i.e. the driven axle is loaded to a maximum value given by legislation or design  
0010 Load fixing; i.e. the driven axle is loaded to a value defined by the driver  
0011 Pressure ratio 1; i.e. the ratio between the pressures at the driven axle and at the third axle is controlled, so that the ratio equals a fixed value 1  
0100 Pressure ratio 2; i.e. the ratio between the pressures at the driven axle and at the third axle is controlled, so that the ratio equals a fixed value 2  
0101 Optimum traction 1; i.e. the pressure at the driven axle is controlled at a fixed value 1  
0110 Optimum traction 2; i.e. the pressure at the driven axle is controlled at a fixed value 2  
0111 Traction help - load reduce; (i.e. reduce axle load of driven axle to normal load condition)  
1000 Exhaust bellows  
1001 -1101 Not defined  
1110 Reserved  
1111 Don't care/take no action

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 53760                     |                                       |

**SPN 1754      Below Nominal Level Rear Axle**

Signal which indicates whether the actual height of the rear axle is below the nominal (desired) level for the rear axle. For explanations of nominal level see SPN 1734 - Nominal Level Front Axle.

00 Not below  
01 Below  
10 Error  
11 Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65114                    |                                       |



**SPN 1755      Lowering Control Mode Rear Axle**

Signal which indicates the actual lowering level change at the rear axle

00 Lowering not active  
01 Lowering active  
10 Error  
11 Not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 65114

Operational Range: same as data range

**SPN 1756      Lifting Control Mode Rear Axle**

Signal which indicates the actual lifting level change at the rear axle

00 Lifting not active  
01 Lifting active  
10 Error  
11 Not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 65114

Operational Range: same as data range

**SPN 1757      Level Preset Front Axle Right**

Set value for nominal level 'preset level' at the right side of the front axle. This value is referred to 'Normal level 1'. For explanations of normal level 1 see SPN 1734 - Nominal Level Front Axle.

Data Length: 2 bytes  
Resolution: 0.1 mm/bit, -3,200 mm offset  
Data Range: -3,200 to 3,225.5 mm  
Type: Status  
Supporting Information:  
PGN reference: 53504

Operational Range: same as data range

**SPN 1758      Level Preset Rear Axle Left**

Set value for nominal level 'preset level' at the left side of the rear axle. This value is referred to 'Normal level 1'. For explanations of normal level 1 see SPN 1734 - Nominal Level Front Axle.

|                         |                              |                                       |
|-------------------------|------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                      |                                       |
| Resolution:             | 0.1 mm/bit, -3,200 mm offset |                                       |
| Data Range:             | -3,200 to 3,225.5 mm         | Operational Range: same as data range |
| Type:                   | Status                       |                                       |
| Supporting Information: |                              |                                       |
| PGN reference:          | 53504                        |                                       |

**SPN 1759      Blade Height Set Point - High Resolution**

High resolution for the laser guided blade set point. The high resolution required for more accurate control and 'accurate' unit conversions.

Negative values are below grade, positive values are above grade, zero is on grade.

|                         |                                |                                            |
|-------------------------|--------------------------------|--------------------------------------------|
| Data Length:            | 4 bytes                        |                                            |
| Resolution:             | 100 mm/bit, -209.7152 m offset |                                            |
| Data Range:             | -209.7152 to 211.3929215 m     | Operational Range: -209.7152m to 209.7152m |
| Type:                   | Measured                       |                                            |
| Supporting Information: |                                |                                            |
| PGN reference:          | 65140                          |                                            |

**SPN 1760      Gross Combination Vehicle Weight**

The total weight of the truck and all attached trailers.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 2 bytes             |                                       |
| Resolution:             | 10 kg/bit, 0 offset |                                       |
| Data Range:             | 0 to 642,550 kg     | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65136               |                                       |

**SPN 1761      Aftertreatment 1 SCR Catalyst Tank Level**

A special catalyst uses a chemical reagent to reach legal requirement for NOX emissions. This parameter indicates the level within the catalyst tank.

0 % = Empty  
100% = Full

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 1 byte                    |                                       |
| Resolution:             | 0.4 %/bit, 0 offset       |                                       |
| Data Range:             | 0 to 100 %                | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: | See Appendix D - SPN 1761 |                                       |
| PGN reference:          | 65110                     |                                       |

**SPN 1762      Hydraulic Pressure**

Hydraulic pressure measured at the output of the hydraulic pump.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 2 bytes             |                                       |
| Resolution:             | 2 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 128,510 kPa    | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 61448               |                                       |

**SPN 1763      Engine Hydraulic Pressure Governor Mode Indicator**

Mode for governor operation is hydraulic pressure control.

00 Disabled  
01 Enabled  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61448                    |                                       |

**SPN 1764      Engine Hydraulic Pressure Governor Switch**

Switch that sets the mode of hydraulic governor

00 Pressure Mode Inactive  
01 Pressure Mode Active  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61448                    |                                       |

**SPN 1765      Engine Requested Fuel Valve 1 Position**

The requested position of a gaseous fuel valve 1 that is metering the fuel flow to the engine.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Status              |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65153               |                                       |

**SPN 1766      Engine Requested Fuel Valve 2 Position**

The requested position of a gaseous fuel valve 2 that is metering the fuel flow to the engine, as requested by the Engine Control Unit.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Status              |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65153               |                                       |

**SPN 1767      Specific Heat Ratio**

The specific heat ratio of the fuel.

|                         |                     |                                |
|-------------------------|---------------------|--------------------------------|
| Data Length:            | 2 bytes             |                                |
| Resolution:             | 0.001/bit, 0 offset |                                |
| Data Range:             | 0 to 64.255         | Operational Range: 0 to 2.0000 |
| Type:                   | Status              |                                |
| Supporting Information: |                     |                                |
| PGN reference:          | 65109               |                                |

**SPN 1768      Engine Low Limit Threshold for Maximum RPM from Engine**

Minimum allowable value for maximum continuous RPM from engine

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 1 byte               |                                       |
| Resolution:             | 32 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 8,000 rpm       | Operational Range: same as data range |
| Type:                   | Status               |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 65108                |                                       |

**SPN 1769      Engine High Limit Threshold for Minimum Continuous Engine RPM**

Maximum allowable value for minimum continuous RPM from engine

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 1 byte               |                                       |
| Resolution:             | 32 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 8,000 rpm       | Operational Range: same as data range |
| Type:                   | Status               |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 65108                |                                       |

**SPN 1770      Engine Low Limit Threshold for Maximum Torque from Engine**

Minimum allowable value for maximum continuous torque from engine

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 1 %/bit, -125 % offset |                                       |
| Data Range:             | -125 to 125 %          | Operational Range: same as data range |
| Type:                   | Status                 |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65108                  |                                       |

**SPN 1771      Engine High Limit Threshold for Minimum Continuous Torque from Engine**

Maximum allowable value for minimum continuous torque from engine

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 1 %/bit, -125 % offset |                                       |
| Data Range:             | -125 to 125 %          | Operational Range: same as data range |
| Type:                   | Status                 |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65108                  |                                       |

**SPN 1772      Engine Maximum Continuous RPM**

Applied limit for maximum continuous engine RPM

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 1 byte               |                                       |
| Resolution:             | 32 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 8,000 rpm       | Operational Range: same as data range |
| Type:                   | Status               |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 65108                |                                       |

**SPN 1773      Engine Minimum Continuous RPM**

Applied limit for minimum continuous engine RPM

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 1 byte               |                                       |
| Resolution:             | 32 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 8,000 rpm       | Operational Range: same as data range |
| Type:                   | Status               |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 65108                |                                       |

**SPN 1774      Engine Maximum Continuous Torque**

Applied limit for maximum continuous engine torque.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 1 %/bit, -125 % offset |                                       |
| Data Range:             | -125 to 125 %          | Operational Range: same as data range |
| Type:                   | Status                 |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65108                  |                                       |

**SPN 1775      Engine Minimum Continuous Torque**

Applied limit for minimum continuous engine torque

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 1 %/bit, -125 % offset |                                       |
| Data Range:             | -125 to 125 %          | Operational Range: same as data range |
| Type:                   | Status                 |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65108                  |                                       |

**SPN 1776      Low Limit Threshold for Maximum RPM from Retarder**

Minimum allowable value for maximum continuous retarder speed

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 1 byte               |                                       |
| Resolution:             | 32 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 8,000 rpm       | Operational Range: same as data range |
| Type:                   | Status               |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 65107                |                                       |

**SPN 1777      High Limit Threshold for Minimum Continuous RPM from Retarder**

Maximum allowable value for minimum continuous retarder speed

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 1 byte               |                                       |
| Resolution:             | 32 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 8,000 rpm       | Operational Range: same as data range |
| Type:                   | Status               |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 65107                |                                       |

**SPN 1778      *Low Limit Threshold for Maximum Torque from Retarder***

Minimum allowable value for maximum continuous retarder torque.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 1 %/bit, -125 % offset |                                       |
| Data Range:             | -125 to 125 %          | Operational Range: same as data range |
| Type:                   | Status                 |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65107                  |                                       |

**SPN 1779      *High Limit Threshold for Minimum Continuous Torque from Retarder***

Maximum allowable value for minimum continuous retarder torque.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 1 %/bit, -125 % offset |                                       |
| Data Range:             | -125 to 125 %          | Operational Range: same as data range |
| Type:                   | Status                 |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65107                  |                                       |

**SPN 1780      *Maximum Continuous Retarder Speed***

Applied limit for maximum continuous retarder RPM

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 1 byte               |                                       |
| Resolution:             | 32 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 8,000 rpm       | Operational Range: same as data range |
| Type:                   | Status               |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 65107                |                                       |

**SPN 1781      *Minimum Continuous Retarder Speed***

Applied limit for minimum continuous retarder RPM

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 1 byte               |                                       |
| Resolution:             | 32 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 8,000 rpm       | Operational Range: same as data range |
| Type:                   | Status               |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 65107                |                                       |

**SPN 1782      *Maximum Continuous Retarder Torque***

Applied limit for maximum continuous retarder torque.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 1 %/bit, -125 % offset |                                       |
| Data Range:             | -125 to 125 %          | Operational Range: same as data range |
| Type:                   | Status                 |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65107                  |                                       |

**SPN 1783      *Minimum Continuous Retarder Torque***

Applied limit for minimum continuous retarder torque

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 1 %/bit, -125 % offset |                                       |
| Data Range:             | -125 to 125 %          | Operational Range: same as data range |
| Type:                   | Status                 |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 65107                  |                                       |

**SPN 1784      *Engine Speed Limit Request - Minimum Continuous***

Requested minimum continuous engine speed

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 1 byte               |                                       |
| Resolution:             | 32 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 8,000 rpm       | Operational Range: same as data range |
| Type:                   | Status               |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 52992                |                                       |

**SPN 1785      *Engine Speed Limit Request - Maximum Continuous***

Requested maximum continuous engine speed

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 1 byte               |                                       |
| Resolution:             | 32 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 8,000 rpm       | Operational Range: same as data range |
| Type:                   | Status               |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 52992                |                                       |



**SPN 1786      Engine Torque Limit Request - Minimum Continuous**

Requested minimum continuous engine torque (operating range: 0 to 125%)

Data Length: 1 byte  
Resolution: 1 %/bit, -125 % offset  
Data Range: -125 to 125 %      Operational Range: 0 to 125%  
Type: Status  
Supporting Information:  
PGN reference: 52992

**SPN 1787      Engine Torque Limit Request - Maximum Continuous**

Requested maximum continuous engine torque (operating range: 0 to 125%)

Data Length: 1 byte  
Resolution: 1 %/bit, -125 % offset  
Data Range: -125 to 125 %      Operational Range: 0 to 125%  
Type: Status  
Supporting Information:  
PGN reference: 52992

**SPN 1788      Minimum Continuous Retarder Speed Limit Request**

Requested minimum continuous retarder speed

Data Length: 1 byte  
Resolution: 32 rpm/bit, 0 offset  
Data Range: 0 to 8,000 rpm      Operational Range: same as data range  
Type: Status  
Supporting Information:  
PGN reference: 52992

**SPN 1789      Maximum Continuous Retarder Speed Limit Request**

Requested maximum continuous retarder speed

Data Length: 1 byte  
Resolution: 32 rpm/bit, 0 offset  
Data Range: 0 to 8,000 rpm      Operational Range: same as data range  
Type: Status  
Supporting Information:  
PGN reference: 52992

**SPN 1790      *Minimum Continuous Retarder Torque Limit Request***

Requested minimum continuous retarder torque (operating range: -125 to 0%)

Data Length: 1 byte  
Resolution: 1 %/bit, -125 % offset  
Data Range: -125 to 125 %      Operational Range: -125 to 0%  
Type: Status  
Supporting Information:  
PGN reference: 52992

**SPN 1791      *Maximum Continuous Retarder Torque Limit Request***

Requested maximum continuous retarder torque (operating range: -125 to 0%)

Data Length: 1 byte  
Resolution: 1 %/bit, -125 % offset  
Data Range: -125 to 125 %      Operational Range: -125 to 0%  
Type: Status  
Supporting Information:  
PGN reference: 52992

**SPN 1792      *Tractor-Mounted Trailer ABS Warning Signal***

This parameter commands the tractor-mounted trailer ABS optical warning signal.

00 Off  
01 On  
10 Reserved  
11 Take no action

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3      Operational Range: same as data range  
Type: Status  
Supporting Information:  
PGN reference: 61441

**SPN 1793      *ATC/ASR Information Signal***

This parameter commands the ATC/ASR driver information signal, for example a dash lamp.

00 Off  
01 On  
10 Reserved  
11 Take no action

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3      Operational Range: same as data range  
Type: Status  
Supporting Information:  
PGN reference: 61441

**SPN 1794      Engine Moment of Inertia**

Moment of inertia for the engine, including items driven full-time by the engine such as fuel, oil and cooling pumps. The inertia from the following items are not included: flywheel, alternator, compressor, fan, and other engine-driven accessories.

|                         |                                        |                                       |
|-------------------------|----------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                                |                                       |
| Resolution:             | 0.004 kg-m <sup>2</sup> /bit, 0 offset |                                       |
| Data Range:             | 0 to 257.02 kg-m <sup>2</sup>          | Operational Range: same as data range |
| Type:                   | Status                                 |                                       |
| Supporting Information: |                                        |                                       |
| PGN reference:          | 65251                                  |                                       |

**SPN 1795      Alternator Current (High Range/Resolution)**

This parameter indicates the amount of electrical current output from the alternator of the main vehicle. Alternator Current (SPN 115) has a lower range and resolution.

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bytes                    |                                       |
| Resolution:             | 0.05 A/bit, -1600 A offset |                                       |
| Data Range:             | -1600 to 1612.75 A         | Operational Range: same as data range |
| Type:                   | Measured                   |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 65106                      |                                       |

**SPN 1796      ACC Distance Alert Signal**

Signal to indicate to the operator that the ACC system is not able to maintain the distance to the target. Example: Target stopping rapidly. This signal may be used to activate warning sounds or indicators.

00 ACC DAS Not Active  
01 ACC DAS Active  
10 Reserved  
11 Take no action

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65135                    |                                       |

**SPN 1797      ACC System Shutoff Warning**

Signal to warn the driver of system deactivation due to non-driver actions. Example: Attempting to control vehicle speed below or above limits of ACC. This signal may be used to activate warning sounds or indicators.

00 ACC SSOW Not Active

01 ACC SSOW Active

10 Reserved

11 Take no action

Data Length:            2 bits

Resolution:            4 states/2 bit, 0 offset

Data Range:            0 to 3

Type:                    Status

Supporting Information:

PGN reference:        65135

Operational Range: same as data range

**SPN 1798      ACC Target Detected**

Signal to indicate to the driver that the ACC system has detected a target.

00 No targets detected

01 Target detected

10 Reserved

11 Take no action

Data Length:            2 bits

Resolution:            4 states/2 bit, 0 offset

Data Range:            0 to 3

Type:                    Status

Supporting Information:

PGN reference:        65135

Operational Range: same as data range

**SPN 1799      Requested ACC Distance Mode**

The Requested Distance Control Mode to the ACC system from the operators interface.

The ACC Set Distance Mode (SPN 1589) indicates the selected Distance Control Mode for the ACC system. This parameter is the driver requested setting for this.

000 Requested ACC Distance Mode #1 (largest distance)  
001 Requested ACC Distance Mode #2  
010 Requested ACC Distance Mode #3  
011 Requested ACC Distance Mode #4  
100 Requested ACC Distance Mode #5 (shortest distance)  
101 not defined  
110 error condition  
111 not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 3 bits                   |                                       |
| Resolution:             | 8 states/3 bit, 0 offset |                                       |
| Data Range:             | 0 to 7                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65105                    |                                       |

**SPN 1800      Battery 1 Temperature**

Temperature of the battery 1. The relation to physical location is determined by the equipment manufacturer.

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 deg C/bit, -40 deg C offset |                                       |
| Data Range:             | -40 to 210 deg C              | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          | 65104                         |                                       |

**SPN 1801      Battery 2 Temperature**

Temperature of the battery 2. The relation to physical location is determined by the equipment manufacturer.

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 deg C/bit, -40 deg C offset |                                       |
| Data Range:             | -40 to 210 deg C              | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          | 65104                         |                                       |

**SPN 1802      Engine Intake Manifold 5 Temperature**

Temperature of pre-combustion air found in intake manifold number 5 of engine air supply system.

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 deg C/bit, -40 deg C offset |                                       |
| Data Range:             | -40 to 210 deg C              | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          | 65189                         |                                       |

**SPN 1803      Engine Intake Manifold 6 Temperature**

Temperature of pre-combustion air found in intake manifold number 6 of engine air supply system.

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 deg C/bit, -40 deg C offset |                                       |
| Data Range:             | -40 to 210 deg C              | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          | 65189                         |                                       |

**SPN 1804      Engine Start Enable Device 2**

Devices that assist an engine in starting, e.g. intake heaters, ether, or an alternate/secondary starting aid. May be of the same type or different than Start Enable Device 1 (SPN 626). Parameter indicating whether the start enable device 2 is ON or OFF.

00 - start enable OFF  
01 - start enable ON  
10 - reserved  
11 - not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64966                    |                                       |

**SPN 1805      LED Display Mode Control**

This parameter informs the system what the selected Display mode will be.

0000 - Center On-Grade Display Mode 1 ( 5 CHANNEL )  
0001 - Offset On-Grade Display Mode  
0010 - Center On-Grade Display Mode 2 ( 7 CHANNEL )  
0011 - 1110 Reserved  
1111 - Not Available or Not Applicable

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 65142                     |                                       |

**SPN 1806      LED Display Deadband Control**

This parameter informs the system what the selected Display deadband will be.

0000 +/- 4.5 mm (0.015 feet, 0.18 inches)  
0001 +/- 12 mm (0.040 feet, 0.45 inches)  
0010 +/- 24 mm (0.080 feet, 0.96 inches)  
0011 +/- 5 mm (0.017 feet, 0.2 inches)  
0100 +/- 1 mm (0.003 feet, 0.04 inches)  
0101 - 1110 Reserved  
1111 Not Available or Not applicable

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 65142                     |                                       |

**SPN 1807      Steering Wheel Angle**

The main operator's steering wheel angle (on the steering column, not the actual wheel angle). The vehicle being steered to the left results in a positive steering wheel angle.

|                         |                                        |                                       |
|-------------------------|----------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                                |                                       |
| Resolution:             | 1/1024 rad per bit, -31.374 rad offset |                                       |
| Data Range:             | -31.374 to +31.374 rad                 | Operational Range: same as data range |
| Type:                   | Measured                               |                                       |
| Supporting Information: |                                        |                                       |
| PGN reference:          | 61449                                  |                                       |

**SPN 1808      Yaw Rate**

Indicates the rotation about the vertical axis. A positive yaw rate signal results when the vehicle turns counter-clockwise.

Data Length: 2 bytes  
Resolution: 1/8192 rad/s per bit, -3.92 rad/s offset  
Data Range: -3.92 to +3.92 rad/s      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 61449

**SPN 1809      Lateral Acceleration**

Indicates a lateral acceleration of the vehicle. A positive lateral acceleration signal results when the vehicle is accelerated to the left.

Data Length: 2 bytes  
Resolution: 1/2048 m/s<sup>2</sup> per bit, -15.687 m/s<sup>2</sup> offset  
Data Range: -15.687 to +15.687 m/s<sup>2</sup>      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 61449

**SPN 1810      Longitudinal Acceleration**

Indicates the longitudinal acceleration of the vehicle. A positive longitudinal acceleration signal results when the vehicle speed increases, regardless of driving the vehicle forward or backward.

Data Length: 1 byte  
Resolution: 0.1 m/s<sup>2</sup> per bit, -12.5 m/s<sup>2</sup> offset  
Data Range: -12.5 to +12.5 m/s<sup>2</sup>      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 61449

**SPN 1811      Steering Wheel Turn Counter**

Indicates number of steering wheel turns, absolute position or relative position at ignition on. Positive values indicate left turns.

Data Length: 6 bits  
Resolution: 1 turn/bit, -32 turns offset  
Data Range: -32 to 29 turns      Operational Range: -10 to +10 Turns  
Type: Measured  
Supporting Information:  
PGN reference: 61449



**SPN 1812      Steering Wheel Angle Sensor Type**

Indicates whether the steering wheel angle sensor is capable of absolute measuring of the number of steering wheel turns or not (relative measuring to position at ignition on).

00 Relative measuring principle  
01 Absolute measuring principle  
10 Reserved  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        61449

Operational Range: same as data range

**SPN 1813      VDC Information Signal**

This parameter commands the VDC information signal, for example a dash lamp.

00 Off  
01 On  
10 Reserved  
11 Don't care/Take no action

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65103

Operational Range: same as data range

**SPN 1814      VDC Fully Operational**

Signal that indicates whether VDC is fully operational or whether its functionality is reduced by a permanent or temporary (e.g. low voltage) defect, by intended action (e.g. disabled by a switch or during special diagnostic procedures), not configured or not yet fully initialized (e.g. missing initialization or configuration message). VDC contains ROP and YC.

00 Not fully operational  
01 Fully operational  
10 Reserved  
11 Don't care/Take no action

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65103

Operational Range: same as data range

**SPN 1815      VDC brake light request**

Indicates whether VDC requests to turn the vehicle brake lights on

00 Turn brake light not on  
01 Turn brake light on  
10 Reserved  
11 Don't care/Take no action

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65103

Operational Range: same as data range

**SPN 1816      ROP Engine Control active**

State Signal which indicates that the Roll Over Prevention (ROP) has commanded engine control to be active. Within the physical limits, ROP attempts to prevent rolling over of the vehicle. Active means that ROP actually tries to control the engine. This state signal is independent of other control commands to the engine which may have higher priority.

00 ROP engine control passive but installed  
01 ROP engine control active  
10 Reserved  
11 Don't care/Take no action

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65103

Operational Range: same as data range

**SPN 1817      YC Engine Control active**

State Signal which indicates that the Yaw Control (YC) has commanded engine control to be active. Within the physical limits, YC attempts to prevent yawing of the vehicle. Active means that YC actually tries to control the engine. This state signal is independent of other control commands to the engine which may have higher priority.

00 YC engine control passive but installed  
01 YC engine control active  
10 Reserved  
11 Don't care/Take no action

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65103

Operational Range: same as data range

**SPN 1818      ROP Brake Control active**

State signal which indicates that Roll over Prevention (ROP) has activated brake control. Active means that ROP actually controls wheel brake pressure at one or more wheels of the vehicle or vehicle combination. Within the physical limits, ROP attempts to prevent rolling over of the vehicle.

00 ROP brake control passive but installed  
01 ROP brake control active  
10 Reserved  
11 Don't care/Take no action

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65103

Operational Range: same as data range

**SPN 1819      YC Brake Control active**

State signal which indicates that Yaw Control (YC) has activated brake control. Active means that YC actually controls wheel brake pressure at one or more wheels of the vehicle or vehicle combination. Within the physical limits, YC attempts to prevent yawing of the vehicle.

00 YC brake control passive but installed  
01 YC brake control active  
10 Reserved  
11 Don't care/Take no action

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65103

Operational Range: same as data range

**SPN 1820      Ramp / Wheel Chair Lift Position**

Signal which indicates the actual position of the ramp / wheel chair lift.

00 Inside bus  
01 Outside bus  
10 Error  
11 Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65102

Operational Range: same as data range

**SPN 1821      *Position of doors***

Signal which indicates the actual position of the doors.

0000 At least 1 door is open  
0001 Closing last door  
0010 All doors closed  
0011-1101 Not defined  
1110 Error  
1111 Not available

Data Length:            4 bits  
Resolution:            16 states/4 bit, 0 offset  
Data Range:            0 to 15  
Type:                    Measured  
Supporting Information:  
PGN reference:        65102

Operational Range: same as data range

**SPN 1822      *Lift Axle 2 Position***

Signal which indicates the position / load condition of lift axle / tag axle #2. Numbering of lift/tag axles starts at front axle.

00 Lift axle position down / tag axle laden  
01 Lift axle position up / tag axle unladen  
10 Error  
11 Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65114

Operational Range: same as data range

**SPN 1823      *Rear Axle in Bumper Range***

Signal which indicates that the vehicle height at the rear axle (SPNs 1723 and 1724) is within the bumper range.

00 Actual level out of bumper range  
01 Actual level within bumper range  
10 Error  
11 Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65114

Operational Range: same as data range

**SPN 1824      Front Axle in Bumper Range**

Signal which indicates that the vehicle height at the front axle (SPNs 1721 and 1722) is within the bumper range.

00 Actual level out of bumper range  
01 Actual level within bumper range  
10 Error  
11 Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65114

Operational Range: same as data range

**SPN 1825      Suspension Remote control 2**

Signal which indicates that the suspension system is controlled by remote control #2. Remote control is an external unit to operate the suspension system.

00 Not active  
01 Active  
10 Error  
11 Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65114

Operational Range: same as data range

**SPN 1826      Suspension Remote Control 1**

Signal which indicates that the suspension system is controlled by remote control #1. Remote control is an external unit to operate the suspension system.

00 Not active  
01 Active  
10 Error  
11 Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65114

Operational Range: same as data range

**(R) SPN 1827      Suspension Control Refusal Information**

Signal which indicates that the air suspension control cannot perform a request due to the operating conditions. It also provides a reason for the refusal.

0000 Actual request not refused  
0001 Axle load limit reached (load transfer)  
0010 Would exceed axle load limit (tag axle)  
0011 Bogie differential not locked  
0100 Above speed limit  
0101 Below speed limit  
0110 General reject; i.e. no specified reason applies  
0111 Requested level not available  
1000 - 1101 Not defined  
1110 Error  
1111 Not available

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 65114                     |                                       |

**SPN 1828      Lift Axle 2 Position Command**

Signal to command the position / load condition of lift / tag axle #2. Numbering of lift/tag axles starts at front axle.

00 Lift axle position down / tag axle laden  
01 Lift axle position up / tag axle unladen  
10 Reserved  
11 Don't care/take no action

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 53760                    |                                       |

**SPN 1829      *Kneeling Command - Rear Axle***

Command signal to activate the kneeling functionality at the rear axle of the vehicle.

00 Deactivate kneeling  
01 Activate kneeling  
10 Reserved  
11 Don't care/take no action

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        53760

Operational Range: same as data range

**SPN 1830      *Kneeling Command - Front Axle***

Command signal to activate the kneeling functionality at the front axle of the vehicle

00 Deactivate kneeling  
01 Activate kneeling  
10 Reserved  
11 Don't care/take no action

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        53760

Operational Range: same as data range

**SPN 1831      *Electronic Shock Absorber Control Mode - Lift/Tag Axle***

Signal which indicates the current mode of operation of the electronic shock absorber control at the lift/tag axle.

00 Normal operation dampers passive  
01 Normal operation dampers active  
10 Error  
11 Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65111

Operational Range: same as data range

**SPN 1832      *Electronic Shock Absorber Control Mode - Rear Axle***

Signal which indicates the current mode of operation of the electronic shock absorber control at the rear axle.

00 Normal operation dampers passive  
01 Normal operation dampers active  
10 Error  
11 Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65111                    |                                       |

**SPN 1833      *Electronic Shock Absorber Control Mode - Front Axle***

Signal which indicates the current mode of operation of the electronic shock absorber control at the front axle.

00 Normal operation dampers passive  
01 Normal operation dampers active  
10 Error  
11 Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65111                    |                                       |

**SPN 1834      *Engine Total Average Fuel Rate***

Average fuel rate, equal to total fuel used divided by total engine hours, over the life of the engine

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bytes                    |                                       |
| Resolution:             | 0.05 L/h per bit, 0 offset |                                       |
| Data Range:             | 0 to 3,212.75 L/h          | Operational Range: same as data range |
| Type:                   | Measured                   |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 65101                      |                                       |

**SPN 1835      *Engine Total Average Fuel Economy***

Average fuel economy, equal to total vehicle distance divided by total fuel used, over the life of the engine

|                         |                              |                                       |
|-------------------------|------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                      |                                       |
| Resolution:             | 1/512 km/L per bit, 0 offset |                                       |
| Data Range:             | 0 to 125.5 km/L              | Operational Range: same as data range |
| Type:                   | Measured                     |                                       |
| Supporting Information: |                              |                                       |
| PGN reference:          | 65101                        |                                       |



**SPN 1836      Trailer ABS Status**

State signal which indicates that ABS in the trailer is actively controlling the brakes. A message is sent to the tractor from the trailer (i.e. by PLC). The receiving device in the tractor transfers this information to the J1939 network. At the beginning of power on the message is sent by the trailer to indicate if this status information is supported. Timeout of the trailer ABS active can be done by monitoring of the Trailer warning light information.

00 Trailer ABS Status Information Available But Not Active  
01 Trailer ABS Active  
10 Reserved  
11 Trailer ABS Status Information Not Available or Parameter Not Supported

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61441                    |                                       |

**SPN 1837      Convoy Driving Lamp Select**

Black Out Convoy Driving Lamp Selection

00 Off  
01 On  
10 Reserved  
11 Not Supported

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65100                    |                                       |

**SPN 1838      Convoy Lamp Select**

Black Out Convoy Lamp Selection

00 Off  
01 On  
10 Reserved  
11 Not Supported

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65100                    |                                       |

**SPN 1839      Front Black Out Marker Lamp Select**

Front Black Out Marker Lamp Selection

00 Off  
01 On  
10 Reserved  
11 Not Supported

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65100

Operational Range: same as data range

**SPN 1840      Rear Black Out Marker Select**

Rear Black Out Marker Selection

00 Off  
01 On  
10 Reserved  
11 Not Supported

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65100

Operational Range: same as data range

**SPN 1841      Black Out Brake/Stop Lamp Select**

Black Out Brake/Stop Lamp Selection

00 Off  
01 On  
10 Reserved  
11 Not Supported

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65100

Operational Range: same as data range

**SPN 1842      *Black Out Work Lamp Select***

Black Out Work Lamp Selection

00 Off  
01 On  
10 Reserved  
11 Not Supported

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65100

Operational Range: same as data range

**SPN 1843      *Night Vision Illuminator Select***

Night Vision Illuminator Selection

00 Off  
01 On  
10 Reserved  
11 Not Supported

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65100

Operational Range: same as data range

**SPN 1844      *Operators Black Out Intensity Selection***

Operators Selection of lamp intensity in black out mode. This parameter provides the operators selected illumination intensity as a percentage of available full scale. This parameter would be typically used as a dash or instrument cluster intensity adjustment.

Data Length:            1 byte  
Resolution:            0.4 %/bit, 0 offset  
Data Range:            0 to 100 %  
Type:                    Status  
Supporting Information:  
PGN reference:        65100

Operational Range: same as data range

**SPN 1845      *Transmission Torque Limit***

Parameter provided to the engine from the transmission as a torque limit to be invoked by the engine in the event that J1939 communication with the transmission is lost.

The intention is to protect transmissions that use a continuous torque limit during torque converter mode or operation in specific lower gears, where stall or drivetrain torque may reach levels higher than the gearbox capacity. If communication is lost during torque limited operation, unrestricted engine torque output could harm the transmission.

It is recommended that engines use reception of the ETC#1 message as a transmission "heartbeat". In the event that the ETC#1 message is not received in a time period of 5 times its' broadcast rate ( $5 \times 10 \text{ ms} = 50 \text{ ms}$ ), the engine should invoke a torque limit holding the engine to less than or equal to the value of the Transmission Torque Limit parameter. The engine may release the limit when transmission-to-engine communication is re-established.

A value of 0xFF00 to 0xFFFF indicates that no transmission torque limit is desired.

It is expected that the engine will record this torque value in non-volatile memory and will include this in the engine configuration PGN as parameter Engine Default Torque Limit (SPN 1846)

If the engine observes change in this parameter value on power-up, the engine should record the new value.

|                         |                    |                                       |
|-------------------------|--------------------|---------------------------------------|
| Data Length:            | 2 bytes            |                                       |
| Resolution:             | 1 Nm/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 Nm     | Operational Range: same as data range |
| Type:                   | Measured           |                                       |
| Supporting Information: |                    |                                       |
| PGN reference:          | 65099              |                                       |

**SPN 1846      *Engine Default Torque Limit***

Companion parameter to Transmission Torque Limit (SPN 1845). This "echo" parameter provides confirmation to the transmission that the engine has received and will invoke the requested Transmission Torque Limit in the event that J1939 communication is lost between the two devices.

If the engine supports this protection logic, the Engine Default Torque Limit parameter should be set equal to the Transmission Torque Limit parameter as received in the Transmission Configuration 2 message (PGN 65099). Otherwise, an Engine Default Torque Limit value of FF00 to FFFF indicates that no engine default torque limit has been received or set.

The intention is to protect transmissions that use a continuous torque limit during torque converter mode or operation in specific lower gears, where stall or drivetrain torque may reach levels higher than the gearbox capacity. If communication is lost during torque limited operation, unrestricted engine torque output could harm the transmission.

It is recommended that engines use reception of the ETC#1 message as a transmission "heartbeat". In the event that the ETC#1 message is not received in a time period of 5 times its' broadcast rate ( $5 \times 10 \text{ ms} = 50 \text{ ms}$ ), the engine should invoke a torque limit holding the engine to less than or equal to the value of the Transmission Torque Limit parameter. The engine may release the limit when engine-to-transmission communication is re-established.

|                         |                    |                                       |
|-------------------------|--------------------|---------------------------------------|
| Data Length:            | 2 bytes            |                                       |
| Resolution:             | 1 Nm/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 Nm     | Operational Range: same as data range |
| Type:                   | Measured           |                                       |
| Supporting Information: |                    |                                       |
| PGN reference:          | 65251              |                                       |

**SPN 1849      *Transmission Requested Range Display Flash State***

State signal indicating a transmission request for the display of the Transmission Requested Range parameter (SPN 162) to flash or not to flash. The 'Transmission Requested Range Display Flash State' indicator can be utilized by (but not limited to) the shift console, instrument cluster, or cab display. Definition of the cause of this state is at the discretion of the transmission manufacturer. The flash period shall be 700 ms @ 50% duty cycle.

Transmission manufacturers may want to flash the Transmission Requested Range display depending on certain events. It could be because a gear could not be attained, or because fluid is low, etc. Indicator should be on for 350 ms and off for 350 ms.

Transmissions supporting both this parameter and the Transmission Requested Range Display Blank State should treat the active states of these parameters as mutually exclusive; both parameters should not indicate "active" at the same time.

00 Inactive; Transmission Requested Range display should not be flashing

01 Active; Transmission Requested Range display should be flashing

10 Reserved

11 Take no action

Data Length: 2 bits

Resolution: 4 states/2 bit, 0 offset

Data Range: 0 to 3

Operational Range: same as data range

Type: Status

Supporting Information:

PGN reference: 65098

**SPN 1850      *Transmission Requested Range Display Blank State***

State signal indicating a transmission request for the display of the Transmission Requested Range parameter (SPN162) to be blanked or not blanked. The 'Transmission Requested Range Display Blank State' indicator can be utilized by (but not limited to) the shift console, instrument cluster, or cab display. Definition of the cause of this state is at the discretion of the transmission manufacturer

Transmission manufacturers may want to blank the Transmission Requested Range display depending on certain events. Typically it is an indication of a shift selector problem.

Transmissions supporting both this parameter and the Transmission Requested Range Display Flash State should treat the active states of these parameters as mutually exclusive; both parameters should not indicate "active" at the same time.

00 Inactive; Transmission Requested Range display should not be blanked

01 Active; Transmission Requested Range display should be blanked

10 Reserved

11 Take no action

Data Length: 2 bits

Resolution: 4 states/2 bit, 0 offset

Data Range: 0 to 3

Operational Range: same as data range

Type: Status

Supporting Information:

PGN reference: 65098

**SPN 1851      *Transmission Shift Inhibit Indicator***

State signal indicating a transmission request for the Shift Inhibit Indicator to be active or inactive. The shift inhibit indicator can be of lamp or text form, located on (but not limited to) the shift console, instrument cluster, or cab display. Definition of the cause of the 'range inhibit' state is at the discretion of the transmission manufacturer.

Transmission manufacturers may want to indicate that they currently cannot make a requested shift. This could be due to inappropriate vehicle speed or other restrictions.

00 Inactive; shift is not inhibited  
01 Active; shift is inhibited  
10 Reserved  
11 Take no action

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65098

Operational Range: same as data range

**SPN 1852      *Transmission Mode 1***

Indicates whether transmission mode 1 is enabled. Modes are manufacturer specific and are not necessarily mutually exclusive. See also SPN 2536.

00 Disable  
01 Enable  
10 Reserved  
11 Take no action

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        256

Operational Range: same as data range

**SPN 1853      *Transmission Mode 2***

Indicates whether transmission mode 2 is enabled. Modes are manufacturer specific and are not necessarily mutually exclusive. See also SPN 2537.

00 Disable  
01 Enable  
10 Reserved  
11 Take no action

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        256

Operational Range: same as data range

**SPN 1854      Transmission Mode 3**

Indicates whether transmission mode 3 is enabled. Modes are manufacturer specific and are not necessarily mutually exclusive. See also SPN 2538.

00 Disable  
01 Enable  
10 Reserved  
11 Take no action

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        256

Operational Range: same as data range

**SPN 1855      Transmission Mode 4**

Indicates whether transmission mode 4 is enabled. Modes are manufacturer specific and are not necessarily mutually exclusive. See also SPN 2539.

00 Disable  
01 Enable  
10 Reserved  
11 Take no action

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        256

Operational Range: same as data range

**SPN 1856      Seat Belt Switch**

State of switch used to determine if Seat Belt is buckled

00 NOT Buckled  
01 OK - Seat Belt is buckled  
10 Error - Switch state cannot be determined  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        57344

Operational Range: same as data range

**SPN 1857      Winch Oil Pressure Switch**

State of switch used to determine if Winch Oil Pressure is above desired minimum

00 NOT OK- Oil pressure is too low  
01 OK - Oil pressure is above minimum  
10 Error - Switch state cannot be determined  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65128

Operational Range: same as data range

**SPN 2347      High Beam Head Light Command**

Command to activate or de-activate the tractor high beam head light lamps.

00 De-activate  
01 Activate  
10 Reserved  
11 Don't Care

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65089

Operational Range: same as data range

**SPN 2348      High Beam Head Light Data**

This parameter provides measured data from the tractor high beam head light lamps.

00 De-activated  
01 Activated  
10 Fault Detected  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65088

Operational Range: same as data range



**SPN 2349      Low Beam Head Light Command**

Command to activate or de-activate the tractor low beam head light lamps.

00 De-activate  
01 Activate  
10 Reserved  
11 Don't Care

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65089

Operational Range: same as data range

**SPN 2350      Low Beam Head Light Data**

This parameter provides measured data from the tractor low beam head light lamps.

00 De-activated  
01 Activated  
10 Fault Detected  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65088

Operational Range: same as data range

**SPN 2351      Alternate Beam Head Light Command**

Command to activate or de-activate the tractor alternate head lights (only low beam is available on alternate head lights). The alternate position lights are intended for use with loader and snow plows that tend to block the primary head lights.

00 De-activate  
01 Activate  
10 Reserved  
11 Don't Care

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65089

Operational Range: same as data range

**SPN 2352      *Alternate Beam Head Light Data***

This parameter provides measured data from the tractor alternate beam head light lamps.

00 De-activated  
01 Activated  
10 Fault Detected  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65088                    |                                       |

**SPN 2353      *Tractor Front Low Mounted Work Lights Command***

Command to activate or de-activate the tractor front low mounted work lights.

00 De-activate  
01 Activate  
10 Reserved  
11 Don't Care

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65089                    |                                       |

**SPN 2354      *Tractor Front Low Mounted Work Lights***

This parameter provides measured data from the tractor front low mounted work lights.

00 De-activated  
01 Activated  
10 Fault Detected  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65088                    |                                       |

**SPN 2355      *Tractor Front High Mounted Work Lights Command***

Command to activate or de-activate the tractor front high mounted work lights.

00 De-activate  
01 Activate  
10 Reserved  
11 Don't Care

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65089

Operational Range: same as data range

**SPN 2356      *Tractor Front High Mounted Work Lights***

This parameter provides measured data from the tractor front high mounted work lights.

00 De-activated  
01 Activated  
10 Fault Detected  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65088

Operational Range: same as data range

**SPN 2357      *Tractor Underside Mounted Work Lights Command***

Command to activate or de-activate the tractor underside mounted work lights.

00 De-activate  
01 Activate  
10 Reserved  
11 Don't Care

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65089

Operational Range: same as data range

**SPN 2358      *Tractor Underside Mounted Work Lights***

This parameter provides measured data from the tractor underside mounted work lights.

00 De-activated  
01 Activated  
10 Fault Detected  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65088

Operational Range: same as data range

**SPN 2359      *Tractor Rear Low Mounted Work Lights Command***

Command to activate or de-activate the tractor rear low mounted work lights.

00 De-activate  
01 Activate  
10 Reserved  
11 Don't Care

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65089

Operational Range: same as data range

**SPN 2360      *Tractor Rear Low Mounted Work Lights***

This parameter provides measured data from the tractor rear low mounted work lights.

00 De-activated  
01 Activated  
10 Fault Detected  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65088

Operational Range: same as data range

**SPN 2361      *Tractor Rear High Mounted Work Lights Command***

Command to activate or de-activate the tractor rear high mounted work lights.

00 De-activate  
01 Activate  
10 Reserved  
11 Don't Care

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65089                    |                                       |

**SPN 2362      *Tractor Rear High Mounted Work Lights***

This parameter provides measured data from the tractor rear high mounted work lights.

00 De-activated  
01 Activated  
10 Fault Detected  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65088                    |                                       |

**SPN 2363      *Tractor Side Low Mounted Work Lights Command***

Command to activate or de-activate the tractor side low mounted work lights.

00 De-activate  
01 Activate  
10 Reserved  
11 Don't Care

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65089                    |                                       |

**SPN 2364      Tractor Side Low Mounted Work Lights**

This parameter provides measured data from the tractor side low mounted work lights.

00 De-activated  
01 Activated  
10 Fault Detected  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65088                    |                                       |

**SPN 2365      Tractor Side High Mounted Work Lights Command**

Command to activate or de-activate the tractor side high mounted work lights.

00 De-activate  
01 Activate  
10 Reserved  
11 Don't Care

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65089                    |                                       |

**SPN 2366      Tractor Side High Mounted Work Lights**

This parameter provides measured data from the tractor side high mounted work lights.

00 De-activated  
01 Activated  
10 Fault Detected  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65088                    |                                       |

**SPN 2367      *Left Turn Signal Lights Command***

Command to activate or de-activate left turn signal lights on the tractor and all connected implements

00 De-activate  
01 Activate  
10 Reserved  
11 Don't Care

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65089

Operational Range: same as data range

**SPN 2368      *Left Turn Signal Lights***

This parameter provides measured data from the tractor and attached implement left turn signal lights.

00 De-activated  
01 Activated  
10 Fault Detected  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65088

Operational Range: same as data range

**SPN 2369      *Right Turn Signal Lights Command***

Command to activate or de-activate right turn signal lights on the tractor and all connected implements

00 De-activate  
01 Activate  
10 Reserved  
11 Don't Care

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65089

Operational Range: same as data range

**SPN 2370      *Right Turn Signal Lights***

This parameter provides measured data from the tractor and attached implement right turn signal lights.

00 De-activated  
01 Activated  
10 Fault Detected  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65088

Operational Range: same as data range

**SPN 2371      *Left Stop Light Command***

Command to activate or de-activate the tractor and implement left stop lights

00 De-activate  
01 Activate  
10 Reserved  
11 Don't Care

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65089

Operational Range: same as data range

**SPN 2372      *Left Stop Light***

This parameter provides measured data from the tractor and attached implement left stop lights.

00 De-activated  
01 Activated  
10 Fault Detected  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65088

Operational Range: same as data range



**SPN 2373      *Right Stop Light Command***

Command to activate or de-activate the tractor and implement right stop light

00 De-activate  
01 Activate  
10 Reserved  
11 Don't Care

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65089

Operational Range: same as data range

**SPN 2374      *Right Stop Light***

This parameter provides measured data from the tractor and attached implement right stop lights.

00 De-activated  
01 Activated  
10 Fault Detected  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65088

Operational Range: same as data range

**SPN 2375      *Center Stop Light Command***

Command to activate or de-activate the tractor and implement center stop light

00 De-activate  
01 Activate  
10 Reserved  
11 Don't Care

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65089

Operational Range: same as data range

**SPN 2376            Center Stop Light**

This parameter provides measured data from the tractor and attached implement center stop lights.

00 De-activated  
01 Activated  
10 Fault Detected  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65088

Operational Range: same as data range

**SPN 2377            Tractor Marker Light Command**

Command to activate or de-activate tractor and implement front position lights, rear red tail lights, side amber running lights, license plate lights and instrument and switch back lights.

00 De-activate  
01 Activate  
10 Reserved  
11 Don't Care

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65089

Operational Range: same as data range

**SPN 2378            Tractor Marker Light**

This parameter provides measured data from the tractor and attached implement marker lights, including front position lights, rear tail lights, side running lights, license plate lights and instruments and switch back lights.

00 De-activated  
01 Activated  
10 Fault Detected  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65088

Operational Range: same as data range

**SPN 2379      *Implement Marker Light Command***

Command to activate or de-activate implement front position lights, rear red tail lights, side amber running lights, license plate lights and instrument and switch back lights.

00 De-activate  
01 Activate  
10 Reserved  
11 Don't Care

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65089

Operational Range: same as data range

**SPN 2380      *Implement Marker Light***

This parameter provides measured data from an attached implement marker lights, including front position lights, rear tail lights, side running lights, license plate lights and instruments and switch back lights.

00 De-activated  
01 Activated  
10 Fault Detected  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65088

Operational Range: same as data range

**SPN 2381      *Tractor Clearance Light Command***

Command to activate or de-activate the tractor high mounted clearance and center ID lights

00 De-activate  
01 Activate  
10 Reserved  
11 Don't Care

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65089

Operational Range: same as data range

**SPN 2382      *Tractor Clearance Light***

This parameter provides measured data from the tractor high mounted clearance and center ID lights.

00 De-activated  
01 Activated  
10 Fault Detected  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65088

Operational Range: same as data range

**SPN 2383      *Implement Clearance Light Command***

Command to activate or de-activate the implement high mounted clearance and lights.

00 De-activate  
01 Activate  
10 Reserved  
11 Don't Care

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65089

Operational Range: same as data range

**SPN 2384      *Implement Clearance Light***

This parameter provides measured data from an attached implement high mounted clearance lights.

00 De-activated  
01 Activated  
10 Fault Detected  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65088

Operational Range: same as data range

**SPN 2385      *Rotating Beacon Light Command***

Command to activate or de-activate slow moving vehicle indicator lights on tractor and/or implements. Activation of the slow moving vehicle lights implies that the controller should manipulate the lighting as appropriate to provide the slow moving vehicle lighting function.

00 De-activate  
01 Activate  
10 Reserved  
11 Don't Care

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65089

Operational Range: same as data range

**SPN 2386      *Rotating Beacon Light***

This parameter provides measured data from the beacon light on tractor or attached implements.

00 De-activated  
01 Activated  
10 Fault Detected  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65088

Operational Range: same as data range

**SPN 2387      *Tractor Front Fog Lights Command***

Command to activate or de-activate tractor front fog lights.

00 De-activate  
01 Activate  
10 Reserved  
11 Don't Care

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65089

Operational Range: same as data range

**SPN 2388      *Tractor Front Fog Lights***

This parameter provides measured data from the tractor front fog lights.

00 De-activated  
01 Activated  
10 Fault Detected  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65088

Operational Range: same as data range

**SPN 2389      *Rear Fog Light Command***

Command to activate or de-activate tractor or implement rear fog lights.

00 De-activate  
01 Activate  
10 Reserved  
11 Don't Care

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65089

Operational Range: same as data range

**SPN 2390      *Rear Fog Lights***

This parameter provides measured data from the tractor and/or implement rear fog lights.

00 De-activated  
01 Activated  
10 Fault Detected  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65088

Operational Range: same as data range

**SPN 2391      Back Up Light and Alarm Horn Command**

Command to activate or de-activate the back up lights and/ or associated alarm if required

00 De-activate  
01 Activate  
10 Reserved  
11 Don't Care

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65089

Operational Range: same as data range

**SPN 2392      Back Up Light and Alarm Horn**

This parameter provides measured data from the back up lights and/ or associated alarm.

00 De-activated  
01 Activated  
10 Fault Detected  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65088

Operational Range: same as data range

**SPN 2393      Lighting Data Request Command**

Command to provide a response of the light state

00 De-activate  
01 Activate  
10 Reserved  
11 Don't Care

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65089

Operational Range: same as data range

**SPN 2394      *Implement Rear Work Light***

This parameter provides measured data from the implement rear work lamps.

00 De-activated  
01 Activated  
10 Fault Detected  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65088

Operational Range: same as data range

**SPN 2395      *Implement OEM Option 1 Light Command***

Command to activate or de-activate an implement OEM option 1 light. This is provided to meet special needs on implements, such as tank inspection or filling lights.

00 De-activate  
01 Activate  
10 Reserved  
11 Don't Care

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65089

Operational Range: same as data range

**SPN 2396      *Implement OEM Option 1 Light***

This parameter provides measured data from the implement OEM option 1 light.

00 De-activated  
01 Activated  
10 Fault Detected  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65088

Operational Range: same as data range



**SPN 2397      *Implement OEM Option 2 Light Command***

Command to activate or de-activate an implement OEM option 2 light. This is provided to meet special needs on implements, such as tank inspection or filling lights.

00 De-activate  
01 Activate  
10 Reserved  
11 Don't Care

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65089

Operational Range: same as data range

**SPN 2398      *Implement OEM Option 2 Light***

This parameter provides measured data from the implement OEM option 2 light.

00 De-activated  
01 Activated  
10 Fault Detected  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65088

Operational Range: same as data range

**SPN 2399      *Implement Left Forward Work Light Command***

Command to activate or de-activate the forward facing work lights toward the left end of the implement.

00 De-activate  
01 Activate  
10 Reserved  
11 Don't Care

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65089

Operational Range: same as data range

**SPN 2400      *Implement Left Forward Work Light***

This parameter provides measured data from the forward facing work lights toward the left end of the implement.

00 De-activated  
01 Activated  
10 Fault Detected  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65088

Operational Range: same as data range

**SPN 2401      *Implement Right Forward Work Light Command***

Command to activate or de-activate the forward facing work lights toward the right end of the implement.

00 De-activate  
01 Activate  
10 Reserved  
11 Don't Care

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65089

Operational Range: same as data range

**SPN 2402      *Implement Right Forward Work Light***

This parameter provides measured data from the forward facing work lights toward the right end of the implement.

00 De-activated  
01 Activated  
10 Fault Detected  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65088

Operational Range: same as data range

**SPN 2403      *Running Light Command***

Command to activate or de-activate the tractor or powered vehicle running lights. Usually only used for on road vehicles.

00 De-activate  
01 Activate  
10 Reserved  
11 Don't Care

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 65089

Operational Range: same as data range

**SPN 2404      *Running Light***

This parameter provides measured data from the vehicle's running lights.

00 De-activated  
01 Activated  
10 Fault Detected  
11 Not Available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 65088

Operational Range: same as data range

**SPN 2405      *Implement Rear Work Light Command***

Command to activate or de-activate implement rear work lights. (This is also the same as Reversing Lights for truck applications.)

00 De-activate  
01 Activate  
10 Reserved  
11 Don't Care

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 65089

Operational Range: same as data range

**SPN 2406      *Implement Right Facing Work Light Command***

Command to activate or de-activate work lights mounted on an implement to illuminate beyond right end of the implement.

00 De-activate  
01 Activate  
10 Reserved  
11 Don't Care

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65089

Operational Range: same as data range

**SPN 2407      *Implement Right Facing Work Light***

This parameter provides measured data from the work lights mounted on an implement to illuminate beyond right end of the implement.

00 De-activated  
01 Activated  
10 Fault Detected  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65088

Operational Range: same as data range

**SPN 2432      *Engine Demand – Percent Torque***

The requested torque output of the engine by all dynamic internal inputs, including smoke control, noise control and low and high speed governing.

Data Length:            1 byte  
Resolution:            1 %/bit, -125 % offset  
Data Range:            -125 to 125 %  
Type:                    Measured  
Supporting Information: See Appendix D - SPN 2432  
PGN reference:        61444

Operational Range: -125% to +125%

**SPN 2433      Engine Exhaust Gas Temperature - Right Manifold**

Temperature of combustion byproducts within the right engine exhaust manifold. Single manifold engines should use exhaust temperature (SPN 173).

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65031

**SPN 2434      Engine Exhaust Gas Temperature - Left Manifold**

Temperature of combustion byproducts within the left engine exhaust manifold. Single manifold engines should use exhaust temperature (SPN 173).

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65031

**SPN 2435      Sea Water Pump Outlet Pressure**

Gauge pressure of liquid found at outlet of sea water pump in sea water cooling system.

Data Length: 1 byte  
Resolution: 2 kPa/bit, 0 offset  
Data Range: 0 to 500 kPa      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65172

**SPN 2536      Transmission Mode 1 Indicator**

This state signal is the transmission's indication that it is operating under transmission mode 1 (SPN 1852) as commanded via the TC1 message (PGN 256). The definition of the transmission mode is left to the discretion of the transmission manufacturer.

00 Transmission Mode 1 not active  
01 Transmission Mode 1 Active  
10 Error  
11 Not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3      Operational Range: same as data range  
Type: Status  
Supporting Information:  
PGN reference: 65098

**SPN 2537      *Transmission Mode 2 Indicator***

This state signal is the transmission's indication that it is operating under transmission mode 2 (SPN 1853) as commanded via the TC1 message (PGN 256). The definition of the transmission mode is left to the discretion of the transmission manufacturer.

00 Transmission Mode 2 not active  
01 Transmission Mode 2 Active  
10 Error  
11 Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65098

Operational Range: same as data range

**SPN 2538      *Transmission Mode 3 Indicator***

This state signal is the transmission's indication that it is operating under transmission mode 3 (SPN 1854) as commanded via the TC1 message (PGN 256). The definition of the transmission mode is left to the discretion of the transmission manufacturer.

00 Transmission Mode 3 not active  
01 Transmission Mode 3 Active  
10 Error  
11 Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65098

Operational Range: same as data range

**SPN 2539      *Transmission Mode 4 Indicator***

This state signal is the transmission's indication that it is operating under transmission mode 4 (SPN 1855) as commanded via the TC1 message (PGN 256). The definition of the transmission mode is left to the discretion of the transmission manufacturer.

00 Transmission Mode 4 not active  
01 Transmission Mode 4 Active  
10 Error  
11 Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65098

Operational Range: same as data range

**SPN 2576      Laser Receiver Type**

Identifies which type of Laser Receiver transmitted the message.

0 = Reserved  
1 = Linear Laser Receiver  
2 = 1 Meter Survey Receiver  
3 = 2 Meter Survey Receiver  
4 = 2.5 Meter Survey Receiver  
5-250 = Reserved

Data Length:            1 byte  
Resolution:            1 count/bit, 0 offset  
Data Range:            0 to 250  
Type:                    Status  
Supporting Information:  
PGN reference:        65141

Operational Range: 1-4

**SPN 2577      Display Deadbands**

Sets Display Deadbands mode.

0000 - Narrow = +/- 4.5mm  
0001 - Standard = +/- 12mm  
0010 - Wide = +/- 24mm  
0011 - 1110 Reserved  
1111 Not Available

Data Length:            4 bits  
Resolution:            16 states/4 bit, 0 offset  
Data Range:            0 to 15  
Type:                    Status  
Supporting Information:  
PGN reference:        65142

Operational Range: same as data range

**SPN 2578      LED Pattern Control**

Sets LED Pattern control mode on laser leveling systems.

0000 - 5 Channel  
0001 - Offset  
0010 - 7 Channel  
0011 - 1110 Reserved  
1111 Not Available

Data Length:            4 bits  
Resolution:            16 states/4 bit, 0 offset  
Data Range:            0 to 15  
Type:                    Status  
Supporting Information:  
PGN reference:        65142

Operational Range: same as data range

**SPN 2579      Net Battery Current (High Range/Resolution)**

Net flow of electrical current into/out-of the battery or batteries. This parameter is the high range and resolution of SPN 114 - Net Battery Current.

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bytes                    |                                       |
| Resolution:             | 0.05 A/bit, -1600 A offset |                                       |
| Data Range:             | -1600 to 1612.75 A         | Operational Range: same as data range |
| Type:                   | Measured                   |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 65106                      |                                       |

**SPN 2580      Hydraulic Brake Pressure Circuit 1**

Gage hydraulic pressure in circuit 1 of the hydraulic brake system

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 1 byte                |                                       |
| Resolution:             | 100 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 25 MPa           | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64998                 |                                       |

**SPN 2581      Hydraulic Brake Pressure Circuit 2**

Gage hydraulic pressure in circuit 2 of the hydraulic brake system

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 1 byte                |                                       |
| Resolution:             | 100 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 25 MPa           | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64998                 |                                       |

**SPN 2582      Hydraulic Brake Pressure Supply State Circuit 1**

Signal which indicates whether the hydraulic brake pressure supply of circuit 1 is reliable; that is, able to support continued braking.

00 Supply is not reliable  
01 Supply is reliable  
10 Error indicator  
11 Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64998                    |                                       |



**SPN 2583      *Hydraulic Brake Pressure Supply State Circuit 2***

Signal which indicates whether the hydraulic brake pressure supply of circuit 2 is reliable; that is, able to support continued braking.

00 Supply is not reliable  
01 Supply is reliable  
10 Error indicator  
11 Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64998                    |                                       |

**SPN 2584      *Hydraulic Brake Pressure Warning State Circuit 1***

Signal which indicates whether the hydraulic brake pressure of circuit 1 is below the warning level

00 Pressure level sufficient  
01 Pressure level below warning level  
10 Error indicator  
11 Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64998                    |                                       |

**SPN 2585      *Hydraulic Brake Pressure Warning State Circuit 2***

Signal which indicates whether the hydraulic brake pressure of circuit 2 is below the warning level

00 Pressure level sufficient  
01 Pressure level below warning level  
10 Error indicator  
11 Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64998                    |                                       |

**SPN 2586      *Tire Air Leakage Rate***

The pressure loss rate of a tire.

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bytes                    |                                       |
| Resolution:             | 0.1 Pa/s per bit, 0 offset |                                       |
| Data Range:             | 0 Pa/s to 6425.5 Pa/s      | Operational Range: same as data range |
| Type:                   | Measured                   |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 65268                      |                                       |

**SPN 2587      *Tire Pressure Threshold Detection***

Signal indicating the pressure level of the tire. The levels defined represent different pressure conditions of the tire:

000 Extreme over pressure - The tire pressure is at a level where the safety of the vehicle may be jeopardised.  
001 Over pressure - The tire pressure is higher than the pressure defined by the vehicle or tire manufacturer.  
010 No warning pressure - The tire pressure is within the thresholds defined by the vehicle or tire manufacturer.  
011 Under pressure - The tire pressure is lower than the pressure defined by the vehicle or tire manufacturer.  
100 Extreme under pressure - The tire pressure is at a level where the safety of the vehicle may be jeopardised.  
101 Not defined  
110 Error indicator  
111 Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 3 bits                   |                                       |
| Resolution:             | 8 states/3 bit, 0 offset |                                       |
| Data Range:             | 0 to 7                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65268                    |                                       |

**SPN 2588      *Maximum Vehicle Speed Limit 1***

The lowest Maximum Vehicle Speed Limit. This value is the similar to SPN 74. However, SPN 74 was not specifically defined to convey the applied vehicle speed limit or what was possible to be applied. This new SPN is the lowest vehicle speed limit that is possible. Additionally, the lowest vehicle speed limit shall be applied when the J1939 network is no longer providing input regarding the Selected Maximum Vehicle Speed Limit. Exceptions to this exist when the device performing the maximum vehicle speed limiting function has methods of selecting the thresholds separately from the Selected Maximum Vehicle Speed Limit parameter.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 1 byte                   |                                       |
| Resolution:             | 1 km/h per bit, 0 offset |                                       |
| Data Range:             | 0 to 250 km/h            | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64997                    |                                       |

**SPN 2589                    *Maximum Vehicle Speed Limit 2***

The highest of the two lowest vehicle speed limits

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 1 byte                   |                                       |
| Resolution:             | 1 km/h per bit, 0 offset |                                       |
| Data Range:             | 0 to 250 km/h            | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64997                    |                                       |

**SPN 2590                    *Maximum Vehicle Speed Limit 3***

The highest of the three lowest vehicle speed limits

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 1 byte                   |                                       |
| Resolution:             | 1 km/h per bit, 0 offset |                                       |
| Data Range:             | 0 to 250 km/h            | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64997                    |                                       |

**SPN 2591                    *Maximum Vehicle Speed Limit 4***

The highest of the four lowest vehicle speed limits

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 1 byte                   |                                       |
| Resolution:             | 1 km/h per bit, 0 offset |                                       |
| Data Range:             | 0 to 250 km/h            | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64997                    |                                       |

**SPN 2592                    *Maximum Vehicle Speed Limit 5***

The highest of the five lowest vehicle speed limits

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 1 byte                   |                                       |
| Resolution:             | 1 km/h per bit, 0 offset |                                       |
| Data Range:             | 0 to 250 km/h            | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64997                    |                                       |

**SPN 2593      *Maximum Vehicle Speed Limit 6***

The highest of the six lowest vehicle speed limits

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 1 byte                   |                                       |
| Resolution:             | 1 km/h per bit, 0 offset |                                       |
| Data Range:             | 0 to 250 km/h            | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64997                    |                                       |

**SPN 2594      *Maximum Vehicle Speed Limit 7***

The highest of the seven lowest vehicle speed limits

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 1 byte                   |                                       |
| Resolution:             | 1 km/h per bit, 0 offset |                                       |
| Data Range:             | 0 to 250 km/h            | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64997                    |                                       |

**SPN 2595      *Applied Vehicle Speed Limit***

The vehicle speed limit in effect.

251 (0xFB) is used to indicate that a maximum vehicle speed limit is not selected.

|                         |                          |                                                                                                                      |
|-------------------------|--------------------------|----------------------------------------------------------------------------------------------------------------------|
| Data Length:            | 1 byte                   |                                                                                                                      |
| Resolution:             | 1 km/h per bit, 0 offset |                                                                                                                      |
| Data Range:             | 0 to 250 km/h            | Operational Range: 0 to 250 km/h. 251 (0xFB) is used to indicate that a maximum vehicle speed limit is not selected. |
| Type:                   | Status                   |                                                                                                                      |
| Supporting Information: |                          |                                                                                                                      |
| PGN reference:          | 64997                    |                                                                                                                      |

**SPN 2596      Selected Maximum Vehicle Speed Limit**

User selected maximum vehicle speed. If one is selected, then this SPN must equal one of the maximum vehicle speeds #1-#7 from PGN 64997 - Maximum Vehicle Speed Limit Status. If different maximum vehicle speed requests are present from different devices, the lowest requested value should be used.

0 is used to indicate that a maximum vehicle speed is not selected. 1 through 7 are valid selectable speed limits. 8 through 250 are not allowed.

Data Length: 1 byte  
Resolution: 1 count/bit, 0 offset  
Data Range: 0 to 250

Operational Range: 0 is used to indicate that a maximum vehicle speed is not selected. 1 through 7 are valid selectable speed limits. 8 through 250 are not allowed.

Type: Status  
Supporting Information:  
PGN reference: 57344

**SPN 2597      Implement Left Facing Work Light Command**

Command to activate or de-activate work lights mounted on an implement to illuminate beyond left end of the implement.

00 De-activate  
01 Activate  
10 Reserved  
11 Don't Care

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 65089

Operational Range: same as data range

**SPN 2598      Implement Left Facing Work Light**

This parameter provides measured data from the work lights mounted on an implement to illuminate beyond left end of the implement.

00 De-activate  
01 Activate  
10 Fault Detected  
11 Not Available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 65088

Operational Range: same as data range

**SPN 2599      *Fire Apparatus Pump Engagement***

The measured status of the pump used to provide water in fire fighting apparatus for distribution of water through water cannons or fire hoses.

00 Pump not engaged  
01 Pump engaged  
10 Error  
11 Not available or not installed

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        61448

Operational Range: same as data range

**SPN 2600      *Payload Percentage***

The current payload of the equipment, reported as a percentage of the equipment's rated payload limit.

Data Length:            1 byte  
Resolution:            1 %/bit, 0 offset  
Data Range:            0 to 250 %  
Type:                    Measured  
Supporting Information:  
PGN reference:        64996

Operational Range: same as data range

**SPN 2601      *Travel Velocity Control Position***

The position of the travel velocity control component reported as a percentage of the control's full displacement in each direction respectively. Positive position values indicate forward travel direction; negative position values indicate reverse, or backward, travel direction; and zero (0) percent position indicates the control device is in the neutral position. Higher percent for a particular travel direction indicates a higher desired travel speed in that direction.

Data Length:            1 byte  
Resolution:            1 %/bit, -125 % offset  
Data Range:            -125 to 125 %  
Type:                    Measured  
Supporting Information:  
PGN reference:        64995

Operational Range: same as data range

**SPN 2602      *Hydraulic Oil Level***

This parameter indicates the level of the hydraulic fluid in tank as a ratio of current volume to total tank volume. This parameter is intended for reporting the hydraulic fluid level in the system tank or reservoir. This hydraulic fluid is for the entire hydraulics system of a piece of equipment.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65128               |                                       |

**SPN 2603      *Pneumatic Supply Pressure Request***

Command signal to influence the pneumatic pressure in the main reservoir. This parameter is the setpoint for the parameter SPN 46.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 8 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 2,000 kPa      | Operational Range: same as data range |
| Type:                   | Status              |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64994               |                                       |

**SPN 2604      *Parking and/or Trailer Air Pressure Request***

Command signal to influence the pneumatic pressure in the circuit or reservoir for the parking brake and/or the trailer supply. This parameter is the setpoint for the parameter SPN 1086.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 8 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 2,000 kPa      | Operational Range: same as data range |
| Type:                   | Status              |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64994               |                                       |

**SPN 2605      *Service Brake Air Pressure Request, Circuit #1***

Command signal to influence the pneumatic pressure in the service brake circuit or reservoir #1. This parameter is the setpoint for the parameter SPN 1087.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 8 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 2,000 kPa      | Operational Range: same as data range |
| Type:                   | Status              |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64994               |                                       |

**SPN 2606      Service Brake Air Pressure Request, Circuit #2**

Command signal to influence the pneumatic pressure in the service brake circuit or reservoir #2. This parameter is the setpoint for the parameter SPN 1088.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 8 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 2,000 kPa      | Operational Range: same as data range |
| Type:                   | Status              |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64994               |                                       |

**SPN 2607      Auxiliary Equipment Supply Pressure Request**

Command signal to influence the pneumatic pressure in the auxiliary circuit. This parameter is the setpoint for the parameter SPN 1089.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 8 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 2,000 kPa      | Operational Range: same as data range |
| Type:                   | Status              |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64994               |                                       |

**SPN 2608      Air Suspension Supply Pressure Request**

Command signal to influence the pneumatic pressure in the circuit for the electronically controlled air suspension system. This parameter is the setpoint for the parameter SPN 1090.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 8 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 2,000 kPa      | Operational Range: same as data range |
| Type:                   | Status              |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64994               |                                       |

**SPN 2609      Cab A/C Refrigerant Compressor Outlet Pressure**

This is the gage pressure at the compressor outlet in the cab air conditioning system.

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 1 byte               |                                       |
| Resolution:             | 16 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 4000 kPa        | Operational Range: same as data range |
| Type:                   | Measured             |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 64993                |                                       |



**SPN 2610      *Solar Intensity Percent***

This is the solar radiation (power density) falling on the vehicle in percent of the maximum sensor value (SPN 2611). Currently this is in the infra-red spectrum.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64992               |                                       |

**SPN 2611      *Solar Sensor Maximum***

This is the maximum value which can be reported by the sensor for the solar intensity. (This is a configuration parameter)

|                         |                                          |                                       |
|-------------------------|------------------------------------------|---------------------------------------|
| Data Length:            | 1 byte                                   |                                       |
| Resolution:             | 0.4 mW/cm <sup>2</sup> per bit, 0 offset |                                       |
| Data Range:             | 0 to 100 mW/cm <sup>2</sup>              | Operational Range: same as data range |
| Type:                   | Status                                   |                                       |
| Supporting Information: |                                          |                                       |
| PGN reference:          | 64992                                    |                                       |

**SPN 2612      *Front Wheel Drive Actuator Status***

Feedback on the front wheel drive actuator.

00 Front Wheel Drive Actuator not engaged  
01 Front Wheel Drive Actuator engaged  
10 Error  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64991                    |                                       |

**SPN 2613      *Drive Axle Lube Pressure***

The drive axle lubricant pressure with location determined by Drive Axle Location (SPN 930).

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 4 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 1000 kPa       | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65273               |                                       |

**SPN 2614      *Steering Axle Lube Pressure***

The steering axle lubricant pressure.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 4 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 1000 kPa       | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65273               |                                       |

**SPN 2615      *Engine Throttle Synchronization Mode Status***

The status of the Throttle Synchronization Mode. Throttle Synchronization Mode is used to indicate which throttle, if any, is currently being used for the synchronized throttle.

0000 Not Synchronized  
0001 Synchronized Center  
0010 Synchronized Port  
0011 Synchronized Starboard  
0100 Synchronized Master  
0101-1110 Reserved  
1111 Take no action

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64988                     |                                       |

**SPN 2616      *Trolling Mode Status***

The status of the Trolling Mode. Trolling mode limits the top speed. Full range travel of the throttle level spans from low idle engine speed to maximum trolling speed.

00 Trolling mode is OFF.  
01 Trolling mode is ACTIVE.  
10 Reserved  
11 Take no action

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64988                    |                                       |

**SPN 2617      *Slow Vessel Mode Status***

The status of the Slow Vessel Mode. Slow Vessel Mode puts the engine in a lower-than-normal low idle speed during docking or other slow vessel operations.

00 Slow vessel mode is OFF.

01 Slow vessel mode is ACTIVE.

10 Reserved

11 Take no action

Data Length: 2 bits

Resolution: 4 states/2 bit, 0 offset

Data Range: 0 to 3

Operational Range: same as data range

Type: Status

Supporting Information:

PGN reference: 64988

**SPN 2629      *Engine Turbocharger 1 Compressor Outlet Temperature***

Temperature of the air exiting the turbocharger 1 compressor outlet

Data Length: 2 bytes

Resolution: 0.03125 deg C/bit, -273 deg C offset

Data Range: -273 to 1734.96875 deg C

Operational Range: same as data range

Type: Measured

Supporting Information:

PGN reference: 64979

**(R) SPN 2630      *Engine Charge Air Cooler 1 Outlet Temperature***

Temperature of combustion air after it exits from the Charge Air Cooler 1 but before any mixing of recirculated exhaust gas.

Data Length: 2 bytes

Resolution: 0.03125 deg C/bit, -273 deg C offset

Data Range: -273 to 1734.96875 deg C

Operational Range: same as data range

Type: Measured

Supporting Information:

PGN reference: 65129

**SPN 2631      *Engine Charge Air Cooler Outlet Pressure***

Measures pressure of air at outlet from charge air cooler

Data Length: 1 byte

Resolution: 2 kPa/bit, 0 offset

Data Range: 0 to 500 kPa

Operational Range: same as data range

Type: Measured

Supporting Information:

PGN reference: 64938

**(R) SPN 2659      Engine Exhaust Gas Recirculation 1 (EGR1) Mass Flow Rate**

Flow rate of gas through the EGR system. Flow rate of the exhaust gas being recirculated into the combustion air.

|                         |                             |                                       |
|-------------------------|-----------------------------|---------------------------------------|
| Data Length:            | 2 bytes                     |                                       |
| Resolution:             | 0.05 kg/h per bit, 0 offset |                                       |
| Data Range:             | 0 to 3212.75 kg/h           | Operational Range: same as data range |
| Type:                   | Measured                    |                                       |
| Supporting Information: |                             |                                       |
| PGN reference:          | 61450                       |                                       |

**SPN 2660      Joystick 1 X-Axis Position**

The position of the joystick in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

|                         |                     |                                  |
|-------------------------|---------------------|----------------------------------|
| Data Length:            | 10 bits             |                                  |
| Resolution:             | 0.1 %/bit, 0 offset |                                  |
| Data Range:             | 0 to 102 %          | Operational Range: 0.0 to 100.0% |
| Type:                   | Measured            |                                  |
| Supporting Information: |                     |                                  |
| PGN reference:          | 64982               |                                  |

**SPN 2661      Joystick 1 Y-Axis Position**

The position of the joystick in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

|                         |                     |                                  |
|-------------------------|---------------------|----------------------------------|
| Data Length:            | 10 bits             |                                  |
| Resolution:             | 0.1 %/bit, 0 offset |                                  |
| Data Range:             | 0 to 102 %          | Operational Range: 0.0 to 100.0% |
| Type:                   | Measured            |                                  |
| Supporting Information: |                     |                                  |
| PGN reference:          | 64982               |                                  |

**SPN 2662      Joystick 1 Grip X-Axis Position**

The position of the joystick grip in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

|                         |                     |                                  |
|-------------------------|---------------------|----------------------------------|
| Data Length:            | 10 bits             |                                  |
| Resolution:             | 0.1 %/bit, 0 offset |                                  |
| Data Range:             | 0 to 102 %          | Operational Range: 0.0 to 100.0% |
| Type:                   | Measured            |                                  |
| Supporting Information: |                     |                                  |
| PGN reference:          | 64983               |                                  |

**SPN 2663      Joystick 1 Grip Y-Axis Position**

The position of the joystick grip in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

|                         |                     |                                  |
|-------------------------|---------------------|----------------------------------|
| Data Length:            | 10 bits             |                                  |
| Resolution:             | 0.1 %/bit, 0 offset |                                  |
| Data Range:             | 0 to 102 %          | Operational Range: 0.0 to 100.0% |
| Type:                   | Measured            |                                  |
| Supporting Information: |                     |                                  |
| PGN reference:          | 64983               |                                  |

**SPN 2664      Joystick 1 Theta-Axis Position**

The position of the joystick in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

|                         |                     |                                  |
|-------------------------|---------------------|----------------------------------|
| Data Length:            | 10 bits             |                                  |
| Resolution:             | 0.1 %/bit, 0 offset |                                  |
| Data Range:             | 0 to 102 %          | Operational Range: 0.0 to 100.0% |
| Type:                   | Measured            |                                  |
| Supporting Information: |                     |                                  |
| PGN reference:          | 64983               |                                  |

**SPN 2665      Joystick 1 X-Axis Lever Right Positive Position Status**

Reports when the current joystick position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64982                    |                                       |

**SPN 2666      Joystick 1 Y-Axis Lever Forward Positive Position Status**

Reports when the current joystick position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64982

Operational Range: same as data range

**SPN 2667      Joystick 1 Grip X-Axis Lever Right Positive Position Status**

Reports when the current joystick grip position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64983

Operational Range: same as data range

**SPN 2668      Joystick 1 Grip Y-Axis Lever Forward Positive Position Status**

Reports when the current joystick grip position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64983

Operational Range: same as data range

**SPN 2669      Joystick 1 Theta-Axis Clockwise Positive Position Status**

Reports when the current joystick position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64983

Operational Range: same as data range

**SPN 2670      Joystick 1 X-Axis Lever Left Negative Position Status**

Reports when the current joystick position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64982

Operational Range: same as data range

**SPN 2671      Joystick 1 Y-Axis Lever Back Negative Position Status**

Reports when the current joystick position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64982

Operational Range: same as data range

**SPN 2672      Joystick 1 Grip X-Axis Lever Left Negative Position Status**

Reports when the current joystick grip position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64983

Operational Range: same as data range

**SPN 2673      Joystick 1 Grip Y-Axis Lever Back Negative Position Status**

Reports when the current joystick grip position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64983

Operational Range: same as data range

**SPN 2674      Joystick 1 Theta-Axis Counter Clockwise Negative Position Status**

Reports when the current joystick position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64983

Operational Range: same as data range



**SPN 2675      Joystick 1 X-Axis Neutral Position Status**

Reports when the current joystick position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64982

Operational Range: same as data range

**SPN 2676      Joystick 1 Y-Axis Neutral Position Status**

Reports when the current joystick position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64982

Operational Range: same as data range

**SPN 2677      Joystick 1 Grip X-Axis Neutral Position Status**

Reports when the current joystick grip position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64983

Operational Range: same as data range

**SPN 2678      Joystick 1 Grip Y-Axis Neutral Position Status**

Reports when the current joystick grip position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64983                    |                                       |

**SPN 2679      Joystick 1 Theta-Axis Neutral Position Status**

Reports when the current joystick position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64983                    |                                       |

**SPN 2680      Joystick 1 X-Axis Detent Position Status**

Reports when the current joystick position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64982                    |                                       |

**SPN 2681      Joystick 1 Y-Axis Detent Position Status**

Reports when the current joystick position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64982                    |                                       |

**SPN 2682      Joystick 1 Grip X-Axis Detent Position Status**

Reports when the current joystick grip position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64983                    |                                       |

**SPN 2683      Joystick 1 Grip Y-Axis Detent Position Status**

Reports when the current joystick grip position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64983                    |                                       |

**SPN 2684      Joystick 1 Theta-Axis Detent Position Status**

Reports when the current joystick position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64983

Operational Range: same as data range

**SPN 2685      Joystick 1 Button 1 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64982

Operational Range: same as data range

**SPN 2686      Joystick 1 Button 2 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64982

Operational Range: same as data range

**SPN 2687      Joystick 1 Button 3 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64982

Operational Range: same as data range

**SPN 2688      Joystick 1 Button 4 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64982

Operational Range: same as data range

**SPN 2689      Joystick 1 Button 5 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64982

Operational Range: same as data range

**SPN 2690      Joystick 1 Button 6 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64982

Operational Range: same as data range

**SPN 2691      Joystick 1 Button 7 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64982

Operational Range: same as data range

**SPN 2692      Joystick 1 Button 8 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64982

Operational Range: same as data range

**SPN 2693      Joystick 1 Button 9 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64982

Operational Range: same as data range

**SPN 2694      Joystick 1 Button 10 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64982

Operational Range: same as data range

**SPN 2695      Joystick 1 Button 11 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64982

Operational Range: same as data range

**SPN 2696                      Joystick 1 Button 12 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:                2 bits  
Resolution:                4 states/2 bit, 0 offset  
Data Range:                0 to 3  
Type:                        Measured  
Supporting Information:  
PGN reference:              64982

Operational Range: same as data range

**SPN 2697                      Joystick 2 X-Axis Position**

The position of the joystick in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

Data Length:                10 bits  
Resolution:                0.1 %/bit, 0 offset  
Data Range:                0 to 102 %  
Type:                        Measured  
Supporting Information:  
PGN reference:              64984

Operational Range: 0.0 to 100.0%

**SPN 2698                      Joystick 2 Y-Axis Position**

The position of the joystick in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

Data Length:                10 bits  
Resolution:                0.1 %/bit, 0 offset  
Data Range:                0 to 102 %  
Type:                        Measured  
Supporting Information:  
PGN reference:              64984

Operational Range: 0.0 to 100.0%

**SPN 2699                      Joystick 2 Grip X-Axis Position**

The position of the joystick grip in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

Data Length:                10 bits  
Resolution:                0.1 %/bit, 0 offset  
Data Range:                0 to 102 %  
Type:                        Measured  
Supporting Information:  
PGN reference:              64985

Operational Range: 0.0 to 100.0%



**SPN 2700      Joystick 2 Grip Y-Axis Position**

The position of the joystick grip in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

|                         |                     |                                  |
|-------------------------|---------------------|----------------------------------|
| Data Length:            | 10 bits             |                                  |
| Resolution:             | 0.1 %/bit, 0 offset |                                  |
| Data Range:             | 0 to 102 %          | Operational Range: 0.0 to 100.0% |
| Type:                   | Measured            |                                  |
| Supporting Information: |                     |                                  |
| PGN reference:          | 64985               |                                  |

**SPN 2701      Joystick 2 Theta-Axis Position**

The position of the joystick in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

|                         |                     |                                  |
|-------------------------|---------------------|----------------------------------|
| Data Length:            | 10 bits             |                                  |
| Resolution:             | 0.1 %/bit, 0 offset |                                  |
| Data Range:             | 0 to 102 %          | Operational Range: 0.0 to 100.0% |
| Type:                   | Measured            |                                  |
| Supporting Information: |                     |                                  |
| PGN reference:          | 64985               |                                  |

**SPN 2702      Joystick 2 X-Axis Lever Right Positive Position Status**

Reports when the current joystick position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64984                    |                                       |

**SPN 2703      Joystick 2 Y-Axis Lever Forward Positive Position Status**

Reports when the current joystick position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64984

Operational Range: same as data range

**SPN 2704      Joystick 2 Grip X-Axis Lever Right Positive Position Status**

Reports when the current joystick grip position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64985

Operational Range: same as data range

**SPN 2705      Joystick 2 Grip Y-Axis Lever Forward Positive Position Status**

Reports when the current joystick grip position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64985

Operational Range: same as data range

**SPN 2706      Joystick 2 Theta-Axis Clockwise Positive Position Status**

Reports when the current joystick position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64985

Operational Range: same as data range

**SPN 2707      Joystick 2 X-Axis Lever Left Negative Position Status**

Reports when the current joystick position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64984

Operational Range: same as data range

**SPN 2708      Joystick 2 Y-Axis Lever Back Negative Position Status**

Reports when the current joystick position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64984

Operational Range: same as data range

**SPN 2709      Joystick 2 Grip X-Axis Lever Left Negative Position Status**

Reports when the current joystick grip position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64985

Operational Range: same as data range

**SPN 2710      Joystick 2 Grip Y-Axis Lever Back Negative Position Status**

Reports when the current joystick grip position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64985

Operational Range: same as data range

**SPN 2711      Joystick 2 Theta-Axis Counter Clockwise Negative Position Status**

Reports when the current joystick position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64985

Operational Range: same as data range

**SPN 2712      Joystick 2 X-Axis Neutral Position Status**

Reports when the current joystick position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64984

Operational Range: same as data range

**SPN 2713      Joystick 2 Y-Axis Neutral Position Status**

Reports when the current joystick position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64984

Operational Range: same as data range

**SPN 2714      Joystick 2 Grip X-Axis Neutral Position Status**

Reports when the current joystick grip position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64985

Operational Range: same as data range

**SPN 2715      Joystick 2 Grip Y-Axis Neutral Position Status**

Reports when the current joystick grip position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64985                    |                                       |

**SPN 2716      Joystick 2 Theta-Axis Neutral Position Status**

Reports when the current joystick position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64985                    |                                       |

**SPN 2717      Joystick 2 X-Axis Detent Position Status**

Reports when the current joystick position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64984                    |                                       |

**SPN 2718      Joystick 2 Y-Axis Detent Position Status**

Reports when the current joystick position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64984                    |                                       |

**SPN 2719      Joystick 2 Grip X-Axis Detent Position Status**

Reports when the current joystick grip position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64985                    |                                       |

**SPN 2720      Joystick 2 Grip Y-Axis Detent Position Status**

Reports when the current joystick grip position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64985                    |                                       |

**SPN 2721      Joystick 2 Theta-Axis Detent Position Status**

Reports when the current joystick position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64985

Operational Range: same as data range

**SPN 2722      Joystick 2 Button 1 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64984

Operational Range: same as data range

**SPN 2723      Joystick 2 Button 2 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64984

Operational Range: same as data range



**SPN 2724      Joystick 2 Button 3 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64984

Operational Range: same as data range

**SPN 2725      Joystick 2 Button 4 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64984

Operational Range: same as data range

**SPN 2726      Joystick 2 Button 5 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64984

Operational Range: same as data range

**SPN 2727                    Joystick 2 Button 6 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64984

Operational Range: same as data range

**SPN 2728                    Joystick 2 Button 7 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64984

Operational Range: same as data range

**SPN 2729                    Joystick 2 Button 8 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64984

Operational Range: same as data range

**SPN 2730      Joystick 2 Button 9 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64984

Operational Range: same as data range

**SPN 2731      Joystick 2 Button 10 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64984

Operational Range: same as data range

**SPN 2732      Joystick 2 Button 11 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64984

Operational Range: same as data range

**SPN 2733      Joystick 2 Button 12 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64984

Operational Range: same as data range

**SPN 2734      Joystick 3 X-Axis Position**

The position of the joystick in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

Data Length: 10 bits  
Resolution: 0.1 %/bit, 0 offset  
Data Range: 0 to 102 %  
Type: Measured  
Supporting Information:  
PGN reference: 64986

Operational Range: 0.0 to 100.0%

**SPN 2735      Joystick 3 Y-Axis Position**

The position of the joystick in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

Data Length: 10 bits  
Resolution: 0.1 %/bit, 0 offset  
Data Range: 0 to 102 %  
Type: Measured  
Supporting Information:  
PGN reference: 64986

Operational Range: 0.0 to 100.0%

**SPN 2736      Joystick 3 Grip X-Axis Position**

The position of the joystick grip in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

Data Length: 10 bits  
Resolution: 0.1 %/bit, 0 offset  
Data Range: 0 to 102 %  
Type: Measured  
Supporting Information:  
PGN reference: 64987

Operational Range: 0.0 to 100.0%

**SPN 2737      Joystick 3 Grip Y-Axis Position**

The position of the joystick grip in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

|                         |                     |                                  |
|-------------------------|---------------------|----------------------------------|
| Data Length:            | 10 bits             |                                  |
| Resolution:             | 0.1 %/bit, 0 offset |                                  |
| Data Range:             | 0 to 102 %          | Operational Range: 0.0 to 100.0% |
| Type:                   | Measured            |                                  |
| Supporting Information: |                     |                                  |
| PGN reference:          | 64987               |                                  |

**SPN 2738      Joystick 3 Theta-Axis Position**

The position of the joystick in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

|                         |                     |                                  |
|-------------------------|---------------------|----------------------------------|
| Data Length:            | 10 bits             |                                  |
| Resolution:             | 0.1 %/bit, 0 offset |                                  |
| Data Range:             | 0 to 102 %          | Operational Range: 0.0 to 100.0% |
| Type:                   | Measured            |                                  |
| Supporting Information: |                     |                                  |
| PGN reference:          | 64987               |                                  |

**SPN 2739      Joystick 3 X-Axis Lever Right Positive Position Status**

Reports when the current joystick position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64986                    |                                       |

**SPN 2740      Joystick 3 Y-Axis Lever Forward Positive Position Status**

Reports when the current joystick position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64986

Operational Range: same as data range

**SPN 2741      Joystick 3 Grip X-Axis Lever Right Positive Position Status**

Reports when the current joystick grip position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64987

Operational Range: same as data range

**SPN 2742      Joystick 3 Grip Y-Axis Lever Forward Positive Position Status**

Reports when the current joystick grip position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64987

Operational Range: same as data range

**SPN 2743      Joystick 3 Theta-Axis Clockwise Positive Position Status**

Reports when the current joystick position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64987

Operational Range: same as data range

**SPN 2744      Joystick 3 X-Axis Lever Left Negative Position Status**

Reports when the current joystick position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64986

Operational Range: same as data range

**SPN 2745      Joystick 3 Y-Axis Lever Back Negative Position Status**

Reports when the current joystick position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64986

Operational Range: same as data range

**SPN 2746      Joystick 3 Grip X-Axis Lever Left Negative Position Status**

Reports when the current joystick grip position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64987

Operational Range: same as data range

**SPN 2747      Joystick 3 Grip Y-Axis Lever Back Negative Position Status**

Reports when the current joystick grip position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64987

Operational Range: same as data range

**SPN 2748      Joystick 3 Theta-Axis Counter Clockwise Negative Position Status**

Reports when the current joystick position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64987

Operational Range: same as data range



**SPN 2749      Joystick 3 X-Axis Neutral Position Status**

Reports when the current joystick position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64986

Operational Range: same as data range

**SPN 2750      Joystick 3 Y-Axis Neutral Position Status**

Reports when the current joystick position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64986

Operational Range: same as data range

**SPN 2751      Joystick 3 Grip X-Axis Neutral Position Status**

Reports when the current joystick grip position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64987

Operational Range: same as data range

**SPN 2752      Joystick 3 Grip Y-Axis Neutral Position Status**

Reports when the current joystick grip position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64987                    |                                       |

**SPN 2753      Joystick 3 Theta-Axis Neutral Position Status**

Reports when the current joystick position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64987                    |                                       |

**SPN 2754      Joystick 3 X-Axis Detent Position Status**

Reports when the current joystick position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64986                    |                                       |

**SPN 2755      Joystick 3 Y-Axis Detent Position Status**

Reports when the current joystick position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64986                    |                                       |

**SPN 2756      Joystick 3 Grip X-Axis Detent Position Status**

Reports when the current joystick grip position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64987                    |                                       |

**SPN 2757      Joystick 3 Grip Y-Axis Detent Position Status**

Reports when the current joystick grip position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64987                    |                                       |

**SPN 2758      Joystick 3 Theta-Axis Detent Position Status**

Reports when the current joystick position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64987

Operational Range: same as data range

**SPN 2759      Joystick 3 Button 1 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64986

Operational Range: same as data range

**SPN 2760      Joystick 3 Button 2 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64986

Operational Range: same as data range

**SPN 2761      Joystick 3 Button 3 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64986

Operational Range: same as data range

**SPN 2762      Joystick 3 Button 4 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64986

Operational Range: same as data range

**SPN 2763      Joystick 3 Button 5 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64986

Operational Range: same as data range

**SPN 2764      Joystick 3 Button 6 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64986

Operational Range: same as data range

**SPN 2765      Joystick 3 Button 7 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64986

Operational Range: same as data range

**SPN 2766      Joystick 3 Button 8 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64986

Operational Range: same as data range

**SPN 2767      Joystick 3 Button 9 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64986

Operational Range: same as data range

**SPN 2768      Joystick 3 Button 10 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64986

Operational Range: same as data range

**SPN 2769      Joystick 3 Button 11 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64986

Operational Range: same as data range

**SPN 2770      Joystick 3 Button 12 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64986                    |                                       |

**(R) SPN 2789      Engine Turbocharger 1 Calculated Turbine Intake Temperature**

Calculated value of turbine intake temperature based on engine operating conditions, such as intake manifold temperature, charge fuel ratio, injection timing, and engine speed. Use SPN 1180 for actual measured intake temperature.

|                         |                                      |                                       |
|-------------------------|--------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                              |                                       |
| Resolution:             | 0.03125 deg C/bit, -273 deg C offset |                                       |
| Data Range:             | -273 to 1734.96875 deg C             | Operational Range: same as data range |
| Type:                   | Status                               |                                       |
| Supporting Information: |                                      |                                       |
| PGN reference:          | 64981                                |                                       |

**(R) SPN 2790      Engine Turbocharger 1 Calculated Turbine Outlet Temperature**

Calculated value of turbocharger compressor outlet air temperature. Temperature of air exiting the turbocharger compressor and before entering charge air cooler. The estimate is based on turbo speed and measured turbocharger compressor intake temperature. Use SPN 1184 for actual measured outlet temperature.

|                         |                                      |                                       |
|-------------------------|--------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                              |                                       |
| Resolution:             | 0.03125 deg C/bit, -273 deg C offset |                                       |
| Data Range:             | -273 to 1734.96875 deg C             | Operational Range: same as data range |
| Type:                   | Status                               |                                       |
| Supporting Information: |                                      |                                       |
| PGN reference:          | 64981                                |                                       |

**(R) SPN 2791      Engine Exhaust Gas Recirculation 1 (EGR1) Valve Control**

Desired percentage of maximum Exhaust Gas Recirculation (EGR) valve opening. 0% means valve is closed. 100% means maximum valve opening (full gas flow).

|                         |                        |                              |
|-------------------------|------------------------|------------------------------|
| Data Length:            | 2 bytes                |                              |
| Resolution:             | 0.0025 %/bit, 0 offset |                              |
| Data Range:             | 0 to 160.6375 %        | Operational Range: 0 to 100% |
| Type:                   | Status                 |                              |
| Supporting Information: |                        |                              |
| PGN reference:          | 64981                  |                              |



**SPN 2792      Engine Variable Geometry Turbocharger (VGT) Air Control Shutoff Valve**

Isolates vehicle brake air from the Variable Geometry Turbocharger (VGT) system when engine is not running. This valve prevents vehicle air from bleeding off through the VGT Control Valve when engine is not in use. Primary vehicle air system from air tanks feed the VGT Air Control Shutoff Valve, which in turn provides air to the VGT Control Valve when the key switch is 'ON'. The VGT Control Valve delivers air to the VGT actuator to adjust turbocharger geometry.

00 VGT Air Control Shutoff Valve is Off  
01 VGT Air Control Shutoff Valve is On  
10 Reserved  
11 Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64981                    |                                       |

**SPN 2793      Laser Strike Data Latency**

Time from laser strike to CAN message transmission. This parameter will be reported by survey receiver type devices only. Byte 3 (SPN 2576) of PGN 65141 identifies the type of Laser Receiver.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 51.2 us/bit, 0 offset |                                       |
| Data Range:             | 0 to 3.289856 s       | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65141                 |                                       |

**SPN 2794      Absolute Laser Strike Position**

Laser Strike location on the survey type laser receiver.

|                         |                                 |                                       |
|-------------------------|---------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                         |                                       |
| Resolution:             | 0.1 mm/bit, 0 offset            |                                       |
| Data Range:             | 0 to 6,425.5 mm (0 to 6.4255 m) | Operational Range: same as data range |
| Type:                   | Measured                        |                                       |
| Supporting Information: |                                 |                                       |
| PGN reference:          | 65141                           |                                       |

**SPN 2795      Engine Variable Geometry Turbocharger (VGT) 1 Actuator Position**

Sensor that measures the position of the variable geometry turbocharger actuator. A position of 0% indicates the actuator is in the position creating the smallest geometry turbocharger. A position of 100% represents the largest geometry turbocharger.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64981               |                                       |

**SPN 2796      Transfer Case Selector Switch**

Operator switch to select the condition of the transfer case. States 000 and 001 should be used if the transfer case only functions to switch between 2-wheel and 4-wheel drive. If the transfer case includes a High / Low Range function, states 011 and 100 should be supported as well. For reporting the status of the transfer case, see SPN 3645.

|      |                                             |
|------|---------------------------------------------|
| 000: | 2 wheel high (Normal or 'On Highway' Range) |
| 001: | 4 wheel high (Normal or 'On Highway' Range) |
| 010: | Neutral                                     |
| 011: | 2 wheel low (or 'Off Highway' Range)        |
| 100: | 4 wheel low (or 'Off Highway' Range)        |
| 101: | Reserved for SAE assignment                 |
| 110: | Error indicator                             |
| 111: | Not available                               |

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 3 bits                   |                                       |
| Resolution:             | 8 states/3 bit, 0 offset |                                       |
| Data Range:             | 0 to 7                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64980                    |                                       |

**SPN 2799      Engine Turbocharger 2 Compressor Outlet Temperature**

Temperature of the air exiting the turbocharger 2 compressor outlet

|                         |                                      |                                       |
|-------------------------|--------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                              |                                       |
| Resolution:             | 0.03125 deg C/bit, -273 deg C offset |                                       |
| Data Range:             | -273 to 1734.96875 deg C             | Operational Range: same as data range |
| Type:                   | Measured                             |                                       |
| Supporting Information: |                                      |                                       |
| PGN reference:          | 64979                                |                                       |

**SPN 2800      Engine Turbocharger 3 Compressor Outlet Temperature**

Temperature of the air exiting the turbocharger 3 compressor outlet

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 64979

**SPN 2801      Engine Turbocharger 4 Compressor Outlet Temperature**

Temperature of the air exiting the turbocharger 4 compressor outlet

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 64979

**SPN 2802      Data Memory Usage**

The used storage capacity of the data buffer memory internal to an ECU, such as a data logger.

Data Length: 1 byte  
Resolution: 0.4 %/bit, 0 offset  
Data Range: 0 to 100 %      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 64978

**SPN 2803      Keep-Alive Battery Consumption**

The capacity consumed from the direct battery connection since the key was last turned off. This value is maintained and does not accumulate while the key switch is on. The value is reset to 0 when the key switch is turned to the off position.

Data Length: 2 bytes  
Resolution: 1 mAhr/bit, 0 offset  
Data Range: 0 to 64255mAhr (64.255Ahr)      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 64978

**SPN 2804      FMS-standard Diagnostics Supported**

Status signal which indicates if the FMS Vehicle Interface (FMS Gateway) supports the handling of diagnostic messages from the vehicle network onto the FMS network.

The FMS gateway does NOT support the re-broadcast of diagnostics messages present on the vehicle network.

If this 'FMS-standard Diagnostics Supported' feature is supported by the FMS Gateway, the FMS Gateway will support the requests for diagnostics information (from the FMS device) onto the vehicle network and pass the responses onto the FMS network.

Note: This feature of the FMS Gateway is independent of the 'FMS-standard Requests Supported'. The FMS Gateway may support diagnostics without supporting the 'FMS-standard Requests Supported' function, or visa-versa.

00 Diagnostics Is Not Supported  
01 Diagnostics Is Supported  
10 Reserved  
11 Don't care

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64977                    |                                       |

**SPN 2805      FMS-standard Requests Supported**

Status signal which indicates if the FMS Vehicle Interface (FMS Gateway) will respond to requests from the FMS device for the PGNs listed in the FMS Interface Specification.

This mode is to support FMS gateway devices that only operate in a 'Request' mode.

The FMS PGNs may also be broadcast periodically in this mode.

The FMS Gateway will NOT support the requests for information not included in the FMS Interface Specification onto the vehicle network."

00 On request mode is not supported  
01 On request mode is supported  
10 Reserved  
11 Don't care

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64977                    |                                       |

**SPN 2806      FMS-standard SW-version supported.**

Information that identifies which issue level of the FMS-standard document the software included in the FMS gateway supports. Four bytes, representing xx.yy type revision level identification.

Information to be ASCII equivalent of the numeric revision level of the FMS document, 00.01 to 99.99. The first released version will be 01.00.

Note:

Byte 2 and byte 3 represents the SW version supported for trucks. Version number in the format ab.cd where Byte 2 represents "a" ASCII and Byte 3 represents "b" ASCII.

Byte 4 and byte 5 represents the SW version supported for bus and coaches; version number in the format ab.cd where Byte 4 represents "c" ASCII and Byte 5 represents "d" ASCII.

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 4 bytes           |                                       |
| Resolution:             | ASCII, 0 offset   |                                       |
| Data Range:             | 0 to 255 per byte | Operational Range: same as data range |
| Type:                   | Measured          |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 64977             |                                       |

**SPN 2807      Engine Fuel Shutoff 2 Control**

Control setting for fuel shutoff 2. First instance is SPN 632. For a dual fuel shutoff system, this SPN is representative of the downstream fuel shutoff commanded position. When fuel (gas) is desired at the engine, the fuel shutoff is opened. Otherwise, it is closed.

00 = Open (fuel supplied to engine)  
01 = Closed (no fuel supplied to engine)  
10 = Reserved  
11 = Don't care / take no action

In addition to communicating desired action of fuel shutoff 2 and its driver status, this new SPN can be used to communicate whether fuel shutoff 2 feedback position (if available) matches the commanded position, through the use of FMIs.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64914                    |                                       |

**(R) SPN 2809      Engine Air Filter 2 Differential Pressure**

Change in engine air system pressure, measured across the second air filter, due to the filter and any accumulation of solid foreign matter on or in the filter.

This is for monitoring the air filter on the intake to the second turbocharger. Filter numbering follows the guidelines noted in section Naming Convention For Engine Parameters.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 0.05 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 12.5 kPa          | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 64976                  |                                       |

**(R) SPN 2810      Engine Air Filter 3 Differential Pressure**

Change in engine air system pressure, measured across the third air filter, due to the filter and any accumulation of solid foreign matter on or in the filter.

This is for monitoring the air filter on the intake to the third turbocharger. Filter numbering follows the guidelines noted in section Naming Convention For Engine Parameters.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 0.05 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 12.5 kPa          | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 64976                  |                                       |

**(R) SPN 2811      Engine Air Filter 4 Differential Pressure**

Change in engine air system pressure, measured across the fourth air filter, due to the filter and any accumulation of solid foreign matter on or in the filter.

This is for monitoring the air filter on the intake to the fourth turbocharger. Filter numbering follows the guidelines noted in section Naming Convention For Engine Parameters.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 0.05 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 12.5 kPa          | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 64976                  |                                       |

**SPN 2812      Engine Overspeed Test**

The engine overspeed test signal as measured by the reporting ECM. Engine Overspeed Test is a mechanism to simulate engine overspeed situations, while operating the engine within the engine's safe operating range.

State signal which indicates when the overspeed test input to the ECM is being driven.

00 Engine Overspeed Test Not Active  
01 Engine Overspeed Test Active  
10 Reserved  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65252

Operational Range: same as data range

**SPN 2813      Engine Air Shutoff Command Status**

State signal which indicates when the Air Shutoff driver output is being driven. Disabled means controller wants air flowing to the engine. Status of the airflow shutoff as being commanded by the ECU.

00 Air Shutoff Disabled, not attempting to shutoff engine air supply  
01 Air Shutoff Enabled, attempting to shutoff engine air supply  
10 Reserved  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65252

Operational Range: same as data range

**SPN 2814      Engine Alarm Output Command Status**

State signal which indicates when the Alarm driver output is being driven. Not active means the Controller has no alarm level conditions.

00 Engine Alarm Output Command Not Active  
01 Engine Alarm Output Command Active  
10 Reserved  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65252

Operational Range: same as data range

**SPN 2815      Engine Alarm Acknowledge**

The Engine Alarm Acknowledge Input signal as measured by the reporting ECM. The Engine Alarm Acknowledge is a mechanism for external acknowledgement of the SPN 2814, Engine Alarm Output Command.

00 Engine Alarm Acknowledge Not Active  
01 Engine Alarm Acknowledge Active  
10 Error  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65252

Operational Range: same as data range

**SPN 2863      Front Operator Wiper Switch**

State of operation selected by operator switch for the Wiper in front of the operator position. This parameter, 'Front Operator Wiper Switch' should be used for the control information if either of the other wiper switch parameters is 'Not Available' and the associated wiper still needs to be controlled.

0000 Off  
0001 Low  
0010 Medium  
0011 High  
0100 Delayed 1 (used for the first delay choice when the wiper switch position controls the delay)  
0101 Delayed 2 (used for the second delay choice when the wiper switch position controls the delay)  
0110 Mist (position where external sensor controls wiper rate)  
0111 - 1110 Reserved  
1111 Not available (do not change)

Data Length:            4 bits  
Resolution:            16 states/4 bit, 0 offset  
Data Range:            0 to 15  
Type:                    Measured  
Supporting Information:  
PGN reference:        64973

Operational Range: same as data range



**SPN 2864      Front Non-operator Wiper Switch**

State of operation selected by operator switch for the front wiper not in front of the operator position. The parameter, 'Front Operator Washer Switch' should be used for the control information if this parameter is 'Not Available' and the associated washer still needs to be controlled.

0000 Off  
0001 Low  
0010 Medium  
0011 High  
0100 Delayed 1 (used for the first delay choice when the wiper switch position controls the delay)  
0101 Delayed 2 (used for the second delay choice when the wiper switch position controls the delay)  
0110 Mist (position where external sensor controls wiper rate)  
0111 - 1110 Reserved  
1111 Not available (do not change)

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64973                     |                                       |

**SPN 2865      Rear Wiper Switch**

State of operation selected by operator switch for the rear wiper. The parameter, 'Front Operator Washer Switch' should be used for the control information if this parameter is 'Not Available' and the associated washer still needs to be controlled.

0000 Off  
0001 Low  
0010 Medium  
0011 High  
0100 Delayed 1 (used for the first delay choice when the wiper switch position controls the delay)  
0101 Delayed 2 (used for the second delay choice when the wiper switch position controls the delay)  
0110 Mist (position where external sensor controls wiper rate)  
0111 - 1110 Reserved  
1111 Not available (do not change)

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64973                     |                                       |

**SPN 2866      *Front Operator Washer Switch***

State of operation selected by operator switch for the washer in front of the operator position. This parameter, 'Front Operator Washer Switch' should be used for the control information if either of the other washer switch parameters is 'Not Available' and the associated washer still needs to be controlled.

000 Off  
001 Low  
010 Medium  
011 High  
100 - 110 Reserved  
111 Not available (do not change)

Data Length:            3 bits  
Resolution:            8 states/3 bit, 0 offset  
Data Range:            0 to 7  
Type:                    Measured  
Supporting Information:  
PGN reference:        64973

Operational Range: same as data range

**SPN 2867      *Front Non-operator Washer Switch***

State of operation selected by operator switch for the front washer not in front of the operator position. The parameter, 'Front Operator Washer Switch' should be used for the control information if this parameter is 'Not Available' and the associated washer still needs to be controlled.

000 Off  
001 Low  
010 Medium  
011 High  
100 - 110 Reserved  
111 Not available (do not change)

Data Length:            3 bits  
Resolution:            8 states/3 bit, 0 offset  
Data Range:            0 to 7  
Type:                    Measured  
Supporting Information:  
PGN reference:        64973

Operational Range: same as data range

**SPN 2868      *Rear Washer Function***

State of operation selected by operator switch for the rear washer. The parameter, 'Front Operator Washer Switch' should be used for the control information if this parameter is 'Not Available' and the associated washer still needs to be controlled.

000 Off  
001 Low  
010 Medium  
011 High  
100 - 110 Reserved  
111 Not available (do not change)

Data Length: 3 bits  
Resolution: 8 states/3 bit, 0 offset  
Data Range: 0 to 7  
Type: Measured  
Supporting Information:  
PGN reference: 64973

Operational Range: same as data range

**SPN 2869      *Front Operator Wiper Delay Control***

Time between cycles of the front operator side wiper (i.e. from end of cycle 'n' to start of cycle 'n+1') as selected by the operator control (switch, etc.) in percentage of position with maximum position corresponding to maximum delay selectable. This parameter, 'Front Operator Wiper Delay Control' should be used for the delay information if either of the other delay parameters is 'Not Available' and the function needs to be provided.

Data Length: 1 byte  
Resolution: 0.4 %/bit, 0 offset  
Data Range: 0 to 100 %  
Type: Measured  
Supporting Information:  
PGN reference: 64973

Operational Range: same as data range

**SPN 2870      *Front Non-operator Wiper Delay Control***

Time between cycles of the front non-operator side wiper (i.e. from end of cycle 'n' to start of cycle 'n+1') as selected by the operator control (switch, etc.) in percentage of position with maximum position corresponding to maximum delay selectable. The parameter, 'Front Operator Wiper Delay Control' should be used for the delay information if this parameter is 'Not Available' and the function needs to be provided.

Data Length: 1 byte  
Resolution: 0.4 %/bit, 0 offset  
Data Range: 0 to 100 %  
Type: Measured  
Supporting Information:  
PGN reference: 64973

Operational Range: same as data range

**SPN 2871      Rear Wiper Delay Control**

Time between cycles of the rear wiper (i.e. from end of cycle 'n' to start of cycle 'n+1') as selected by the operator control (switch, etc.) in percentage of position with maximum position corresponding to maximum delay selectable. The parameter, 'Front Operator Wiper Delay Control' should be used for the delay information if this parameter is 'Not Available' and the function needs to be provided.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64973               |                                       |

**SPN 2872      Main Light Switch**

A 4 bit parameter to indicate the selected position of the operator's main light switch.

0000 Off - The position by which the operator selects that none of the lamps are to be on.  
0001 Park On - The position by which the operator selects that the park lamps are to be on.  
0010 Headlight On - The position by which the operator selects that the headlamps are to be on.  
0011 Headlight and Park On - The position by which the operator selects that Both the Headlamps and the Park lamps are to be on.  
0100 - 0111 Reserved  
1000 Delayed Off - The position by which the operator selects that a certain set of lamps are to come On and then are to be turned Off following a delay time (Operators Desired - Delayed Lamp Off Time).  
1001 - 1101 Reserved  
1110 Error  
1111 Not available (do not change)

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64972                     |                                       |

**SPN 2873      Work Light Switch**

A 4 bit parameter to indicate the selected position of the operator's work light switch. In Ag applications the work lights are often referred to as field lights. In on-highway applications the work lights are often referred to as clearance lights and may or may not be operated by a switch separate from the main light switch.

0000 Off - The position by which the operator selects that none of the work lamps are to be on.

0001 Work Light Combination #1 On - The position by which the operator selects that the lamps in the combination defined as Work Light Combination #1 are to be on.

0010 Work Light Combination #2 On - The position by which the operator selects that the lamps in the combination defined as Work Light Combination #2 are to be on.

0011 Work Light Combination #3 On - The position by which the operator selects that the lamps in the combination defined as Work Light Combination #3 are to be on.

0100 Work Light Combination #4 On - The position by which the operator selects that the lamps in the combination defined as Work Light Combination #4 are to be on.

0101-1101 Reserved

1110 Error

1111 Not available (do not change)

Data Length: 4 bits

Resolution: 16 states/4 bit, 0 offset

Data Range: 0 to 15

Operational Range: same as data range

Type: Measured

Supporting Information:

PGN reference: 64972

**SPN 2874      High-Low Beam Switch**

A 2 bit parameter to indicate the selected position of the operator's high/low beam select switch.

00 Low Beam Selected

01 High Beam Selected

10 Error

11 Not available (do not change)

Data Length: 2 bits

Resolution: 4 states/2 bit, 0 offset

Data Range: 0 to 3

Operational Range: same as data range

Type: Measured

Supporting Information:

PGN reference: 64972

**SPN 2875      Hazard Light Switch**

A 2 bit parameter to indicate the selected position of the operator's hazard light switch.

- 00 Hazard Lamps to be Off
- 01 Hazard Lamps to be Flashing
- 10 Error
- 11 Not available (do not change)

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64972

Operational Range: same as data range

**SPN 2876      Turn Signal Switch**

A 4 bit parameter to indicate the selected position of the operator's turn signal switch.

- 0000 No Turn being signaled
- 0001 Left Turn to be Flashing
- 0010 Right turn to be Flashing
- 0011 - 1101 Reserved
- 1110 Error (to include both left and right selected simultaneously)
- 1111 Not available (do not change)

Data Length: 4 bits  
Resolution: 16 states/4 bit, 0 offset  
Data Range: 0 to 15  
Type: Measured  
Supporting Information:  
PGN reference: 64972

Operational Range: same as data range

**SPN 2877      Operators Desired - Delayed Lamp Off Time**

A 16 bit parameter to be associated with Delayed Off position (1000 binary) of the Main Light Switch. This parameter indicates the time the operator wishes to have elapse following the Main Light switch being placed in Delayed Off position before the defined lights turn back off. The Operator's definition as to which lamps are to turn On (and then Off of course) when the Main Light Switch is in the Delayed Off position. The specific lamps are not identified within this message, but are to be stored by whatever device (ecu) is planning to send the lamp command message for said lamps. Said device must also provide the means for the operator to enter and/or adjust said definition.

Data Length: 2 bytes  
Resolution: 1 s/bit, 0 offset  
Data Range: 0 to 64,255 s  
Type: Measured  
Supporting Information:  
PGN reference: 64972

Operational Range: same as data range

**SPN 2878      *Operators Desired Back-light***

A 8 bit parameter to indicate the level of back lighting the operator has selected for displays. This is to be differentiated from the Illumination Brightness Percent (SPN:1487 PGN:53248 Cab Illumination Message) which is sent to the displays to tell them what level to be at. This is the operator desired level (as sensed by operator controls) for those system where the operator controls are monitored by an ecu separate from the ecu sending the command to the displays. Note each display (if appropriate) will need to have its own balance function to compensate its nominal brightness to the same level of that of all other displays. This is especially important for systems with back-lights which may change noticeable with aging. In other words it will be necessary within a vehicle to scale all of the displays down to the same level as the dimmest display (since, obviously you can not make the dimmest brighter).

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64972               |                                       |

**SPN 2879      *Engine Alternate Droop Accelerator 2 Select***

Same description as Engine Alternate Droop Accelerator 1 Select (SPN 2881) except that the selections may apply to Accelerator 2.

0000 – Normal Droop Setting is selected  
0001 thru 1101 – One of Alternate Droop Setting 1 through 13 (in sequential order) is selected  
1110 – Error condition  
1111 – Not available

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64971                     |                                       |

**SPN 2880      *Engine Operator Primary Intermediate Speed Select***

Allows the operator to select one of 13 preprogrammed Intermediate Speed Control settings. If no speed setting is requested, the engine operates normally. The Intermediate Speed Control is widely used in the Industrial application to control the engine to an intermediate speed setting which can either replace the accelerator position control altogether, or limit the accelerator position control to a selectable speed point minimum or maximum.

0000 – indicates that the ISC functionality is not requested, engine operates normally  
0001 thru 1101 – indicates that the ISC Setting 1 thru 13 (in sequential order) is selected  
1110 – error condition  
1111 – not available

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64970                     |                                       |

**SPN 2881      Engine Alternate Droop Accelerator 1 Select**

In some off-highway applications it may be desirable to have multiple droop settings available across the range of engine operation. For example, in an agricultural tractor application, this functionality allows a higher engine speed during low load so as to maximize vehicle speed driven between fields on the road. Another use of the alternate droop settings would be to provide functionality for maintaining an engine speed independent of the applied load on demand. There is a normal droop setting, and up to 13 additional preprogrammed droop settings which are user selectable by switching. The selections apply to Accelerator 1.

0000 – Normal Droop Setting is selected

0001 thru 1101 – One of Alternate Droop Setting 1 through 13 (in sequential order) is selected

1110 – Error condition

1111 – Not available

Data Length: 4 bits

Resolution: 16 states/4 bit, 0 offset

Data Range: 0 to 15

Operational Range: same as data range

Type: Measured

Supporting Information:

PGN reference: 64971

**SPN 2882      Engine Alternate Rating Select**

In some off-highway applications it may be desirable to have multiple engine ratings available for selection by the operator. There is the default engine rating, which provides the maximum available power across the range of operation. There are additional engine ratings which the user can select that allow for alternate fueling across the operational range. Engine rating selection number 1 is the maximum rating. Selection number 2 is the next highest, selection 3 next highest, etc. The selection impacts the operating points in the Engine Configuration.

0 – indicates that Maximum Power Fueling is selected

1 – indicates that the Alternate Power Fueling 1 is selected

2 – indicates that the Alternate Power Fueling 2 is selected

3 – indicates that the Alternate Power Fueling 3 is selected

4 thru 253 - indicates that the Alternate Power Fueling 4 thru 253 (in sequential order) is selected.

254 – Error condition.

255 – Not available

Data Length: 1 byte

Resolution: 1 selection/bit, 0 offset

Data Range: 0 to 255

Operational Range: same as data range

Type: Measured

Supporting Information:

PGN reference: 64971



**SPN 2883      Engine Alternate Low Idle Switch**

Operator switch which selects between two low idle speeds, default and alternate.

The normal programmed low idle is the default low idle, and when the Alternate Low Idle switch is activated, a alternate preprogrammed low idle speed is selected. The accelerator position control operates as normal but is now bounded to a different low idle speed. This selection impacts Point 1 on the Engine Configuration.

00 Default low idle point is selected  
01 Alternate low idle point is selected  
10 Error  
11 Not available or Unused

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64971

Operational Range: same as data range

**SPN 2884      Engine Auxiliary Governor Switch**

This is the On/Off operation of the Auxiliary Governor feature switch. This feature is used to allow engine speed to be controlled by an auxiliary input such as pressure or tailshaft speed. This switch position indicates whether this feature is requested or not.

00 – Auxiliary Governor is disabled  
01 – Auxiliary Governor is enabled  
10 – Error condition  
11 – Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64971

Operational Range: same as data range

**SPN 2885      Engine Alternate Droop Auxiliary Input Select**

In some off-highway applications it may be desirable to have multiple droop settings available across the range of engine operation. For example, in an agricultural tractor application, this functionality allows a higher engine speed during low load so as to maximize vehicle speed driven between fields on the road. Another use of the alternate droop settings would be to provide functionality for maintaining an engine speed independent of the applied load on demand. There is a normal droop setting, and up to 13 additional preprogrammed droop settings which are user selectable by switching. The selections apply to the Alternate Droop Auxiliary Input.

0000 – Normal Droop Setting is selected

0001 thru 1101 – One of Alternate Droop Setting 1 through 13 (in sequential order) is selected

1110 – Error condition

1111 – Not available

Data Length: 4 bits

Resolution: 16 states/4 bit, 0 offset

Data Range: 0 to 15

Operational Range: same as data range

Type: Measured

Supporting Information:

PGN reference: 64971

**SPN 2886      Engine Alternate Droop Remote Accelerator Select**

In some off-highway applications it may be desirable to have multiple droop settings available across the range of engine operation. For example, in an agricultural tractor application, this functionality allows a higher engine speed during low load so as to maximize vehicle speed driven between fields on the road. Another use of the alternate droop settings would be to provide functionality for maintaining an engine speed independent of the applied load on demand. There is a normal droop setting, and up to 13 additional preprogrammed droop settings which are user selectable by switching. The selections apply to the Remote Accelerator.

0000 – Normal Droop Setting is selected

0001 thru 1101 – One of Alternate Droop Setting 1 through 13 (in sequential order) is selected

1110 – Error condition

1111 – Not available

Data Length: 4 bits

Resolution: 16 states/4 bit, 0 offset

Data Range: 0 to 15

Operational Range: same as data range

Type: Measured

Supporting Information:

PGN reference: 64971

**SPN 2887      Total Count of Configuration Changes Made**

Total number of times changes have been made to any of the configurable parameters.

Data Length: 2 bytes

Resolution: 1 count/bit, 0 offset

Data Range: 0 to 64,255 counts

Operational Range: same as data range

Type: Measured

Supporting Information:

PGN reference: 64969

**SPN 2888      Engine Alternate Rating Select State**

In some off-highway applications it may be desirable to have multiple engine ratings available for selection by the operator. There is the default engine rating, which provides the maximum available power across the range of operation. There are additional engine ratings which the engine controller may use that allow for alternate fueling across the operational range. Engine rating number 1 is the maximum rating. Rating number 2 is the next highest, rating 3 next highest, etc.

00 – Control state is Maximum Power Fueling  
01 – Control state is Alternate Power Fueling 1  
02 – Control state is Alternate Power Fueling 2  
03 – Control state is Alternate Power Fueling 3  
04 thru 253 - Control state is Alternate Power Fueling 4 thru 253 (in sequential order)  
254 – SAE reserved  
255 – Not available

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 8 bits                     |                                       |
| Resolution:             | 256 states/8 bit, 0 offset |                                       |
| Data Range:             | 0 to 255                   | Operational Range: same as data range |
| Type:                   | Status                     |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 64967                      |                                       |

**SPN 2889      Engine Alternate Droop Accelerator 1 Select State**

In some off-highway applications it may be desirable to have multiple droop settings available across the range of engine operation. For example, in an agricultural tractor application, this functionality allows a higher engine speed during low load so as to maximize vehicle speed driven between fields on the road. Another use of the alternate droop settings would be to provide functionality for maintaining an engine speed independent of the applied load on demand. There is a normal droop setting, and up to 13 additional preprogrammed droop settings which are user selectable by switching. The selections may apply to Accelerator 1. This parameter indicates which state has been selected by the controlling ECM.

0000 – Control state is Normal Droop Setting  
0001 thru 1101 – Control state is one of Alternate Droop Setting 1 through 13 (in sequential order)  
1110 – SAE reserved  
1111 – Not available

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64967                     |                                       |

**SPN 2890      Engine Multi-Unit Sync State**

This feature is widely used in Industry to operate multiple engines from a single command source. A master engine will "synchronize" one or more slave engines to operate at the same speed. This feature is requested by an operator switch, this parameter indicates the state of the feature as determined by the controlling ECM.

00 Control State is Functionality disabled (off)

01 Control State is Functionality enabled (on)

10 SAE reserved

11 Not available

Data Length:            2 bits

Resolution:            4 states/2 bit, 0 offset

Data Range:            0 to 3

Type:                    Status

Supporting Information:

PGN reference:        64967

Operational Range: same as data range

**SPN 2891      Engine Alternate Low Idle Select State**

In many applications, it is desirable that an alternate low idle speed setting be made available via switch input. The normal programmed low idle is the default low idle, and when the Alternate Low Idle feature is activated, an alternate preprogrammed low idle speed is selected. The accelerator position control operates as normal but is now bounded to a different low idle speed. This selection impacts Point 1 on the Engine Configuration.

00 – Normal idle state

01 – Alternate idle state

10 – SAE reserved

11 – not available

Data Length:            2 bits

Resolution:            4 states/2 bit, 0 offset

Data Range:            0 to 3

Type:                    Status

Supporting Information:

PGN reference:        64967

Operational Range: same as data range

**SPN 2892      *Engine Operator Primary Intermediate Speed Select State***

13 preprogrammed intermediate speed control settings are available for the controlling ECM to select. If no speed setting is requested, the engine operates normally. The Intermediate Speed Control is widely used in the Industrial application to control the engine to an intermediate speed setting which can either replace the accelerator position control altogether, or limit the accelerator position control to a selectable speed point minimum or maximum. This parameter indicates which state has been selected by the controlling ECM.

0000 – Control state is ISC functionality is not requested, engine operates normally

0001 thru 1101 – Control state is ISC Setting 1 thru 13 (in sequential order)

1110 – SAE reserved

1111 – not available

Data Length:            4 bits

Resolution:            16 states/4 bit, 0 offset

Data Range:            0 to 15

Operational Range: same as data range

Type:                    Status

Supporting Information:

PGN reference:        64968

**SPN 2893      *Engine Alternate Droop Accelerator 2 Select State***

In some off-highway applications it may be desirable to have multiple droop settings available across the range of engine operation. For example, in an agricultural tractor application, this functionality allows a higher engine speed during low load so as to maximize vehicle speed driven between fields on the road. Another use of the alternate droop settings would be to provide functionality for maintaining an engine speed independent of the applied load on demand. There is a normal droop setting, and up to 13 additional preprogrammed droop settings which are user selectable by switching. The selections apply to Accelerator 2.

0000 – Control's state is Normal Droop Setting

0001 thru 1101 – Control's state is One of Alternate Droop Setting 1 through 13 (in sequential order)

1110 – SAE reserved

1111 – Not available

Data Length:            4 bits

Resolution:            16 states/4 bit, 0 offset

Data Range:            0 to 15

Operational Range: same as data range

Type:                    Status

Supporting Information:

PGN reference:        64967

**SPN 2894      Engine Alternate Droop Remote Accelerator Select State**

In some off-highway applications it may be desirable to have multiple droop settings available across the range of engine operation. For example, in an agricultural tractor application, this functionality allows a higher engine speed during low load so as to maximize vehicle speed driven between fields on the road. Another use of the alternate droop settings would be to provide functionality for maintaining an engine speed independent of the applied load on demand. There is a normal droop setting, and up to 13 additional preprogrammed droop settings which are user selectable by switching. The selections apply to Remote Accelerator.

0000 – Control state is Normal Droop Setting

0001 thru 1101 – Control state is One of Alternate Droop Setting 1 through 13 (in sequential order)

1110 – SAE reserved

1111 – Not available

Data Length: 4 bits

Resolution: 16 states/4 bit, 0 offset

Data Range: 0 to 15

Operational Range: same as data range

Type: Status

Supporting Information:

PGN reference: 64967

**SPN 2895      Engine Alternate Droop Auxiliary Input Select State**

In some off-highway applications it may be desirable to have multiple droop settings available across the range of engine operation. For example, in an agricultural tractor application, this functionality allows a higher engine speed during low load so as to maximize vehicle speed driven between fields on the road. Another use of the alternate droop settings would be to provide functionality for maintaining an engine speed independent of the applied load on demand. There is a normal droop setting, and up to 13 additional preprogrammed droop settings which are user selectable by switching. The selections apply to Auxiliary Input.

0000 – Control state is Normal Droop Setting

0001 thru 1101 – Control state is One of Alternate Droop Setting 1 through 13 (in sequential order)

1110 – SAE reserved

1111 – Not available

Data Length: 4 bits

Resolution: 16 states/4 bit, 0 offset

Data Range: 0 to 15

Operational Range: same as data range

Type: Status

Supporting Information:

PGN reference: 64967

**SPN 2896      Engine Auxiliary Governor State**

This is the Engine Auxiliary Governor feature. This feature is used to allow engine speed to be controlled by an auxiliary input such as pressure or tailshaft speed. This feature is requested by an operator switch, this parameter indicates the state of the feature as determined by the controlling ECM.

00 – Control State is Auxiliary Governor disabled  
01 – Control State is Auxiliary Governor enabled  
10 – SAE reserved  
11 – Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64967                    |                                       |

**SPN 2897      Operator Engine PTO Governor Memory Select Switch**

Measured state of the operator's engine PTO governor memory select switch. This switch selects which of the two available memory locations is to be used to store the dynamically assigned value. This speed will be set using the PTO governor set switch and modified using the PTO governor accelerate and coast/decelerate switches.

00 PTO set speed memory 1 selected  
01 PTO set speed memory 2 selected  
10 error  
11 not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65264                    |                                       |

**(R) SPN 2898      Engine Start Enable Device 2 Configuration**

The start enable device installed for start enable device 2.

0000 - no start enable device 2 installed  
0001 - glow plugs installed  
0010 - fuelled start installed  
0011 - ether injection installed  
0100 - electric intake air heater installed  
0101 - 1110 - reserved  
1111 - not available

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64966                     |                                       |

**(R) SPN 2899      Engine Start Enable Device 1 Configuration**

The start enable device installed for start enable device 1.

0000 - no start enable device 1 installed  
0001 - glow plugs installed  
0010 - fuelled start installed  
0011 - ether injection installed  
0100 - electric intake air heater installed  
0101 - 1110 - reserved  
1111 - not available

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64966                     |                                       |

**SPN 2900      Transmission Engine Crank Enable**

State signal from the transmission indicating if the transmission's status is such that engine cranking is allowed (i.e. at a minimum, transmission is in neutral and the driveline is disengaged). As sender of this information, the transmission is responsible for correct indication immediately upon first broadcast of this parameter.

As with hard-wired neutral start implementations, those utilizing this parameter should consider the impact of the transmission or other controllers 'resetting' due to voltage drops during the engine start sequence.

The vehicle system design should also consider the impact of timing latency in the engine starting sequence. For example, the turn of an ignition key from 'off' to 'start' may happen more quickly than the transmission controller can boot up, determine its' current state of being, and begin broadcasting information over the J1939 datalink.

00 - Cranking disabled; engine cranking is prohibited by the transmission  
01 - Cranking enabled; engine cranking is allowed by the transmission  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65098                    |                                       |

**SPN 2901      ECU Part Number**

The part number of the physical ECU.

|                         |                                                        |                                       |
|-------------------------|--------------------------------------------------------|---------------------------------------|
| Data Length:            | Variable - up to 200 bytes followed by an "" delimiter |                                       |
| Resolution:             | ASCII, 0 offset                                        |                                       |
| Data Range:             | 0 to 255 per byte                                      | Operational Range: same as data range |
| Type:                   | Measured                                               |                                       |
| Supporting Information: |                                                        |                                       |
| PGN reference:          | 64965                                                  |                                       |



**SPN 2902      ECU Serial Number**

The serial number of the physical ECU.

|                         |                                                        |                                       |
|-------------------------|--------------------------------------------------------|---------------------------------------|
| Data Length:            | Variable - up to 200 bytes followed by an "" delimiter |                                       |
| Resolution:             | ASCII, 0 offset                                        |                                       |
| Data Range:             | 0 to 255 per byte                                      | Operational Range: same as data range |
| Type:                   | Measured                                               |                                       |
| Supporting Information: |                                                        |                                       |
| PGN reference:          | 64965                                                  |                                       |

**SPN 2903      ECU Location**

The location of the ECU within a network.

|                         |                                                        |                                       |
|-------------------------|--------------------------------------------------------|---------------------------------------|
| Data Length:            | Variable - up to 200 bytes followed by an "" delimiter |                                       |
| Resolution:             | ASCII, 0 offset                                        |                                       |
| Data Range:             | 0 to 255 per byte                                      | Operational Range: same as data range |
| Type:                   | Measured                                               |                                       |
| Supporting Information: |                                                        |                                       |
| PGN reference:          | 64965                                                  |                                       |

**SPN 2904      ECU Type**

The type of ECU. One example of a use of the ECU type could be for classifying ECU capabilities, such as I/O.

|                         |                                                        |                                       |
|-------------------------|--------------------------------------------------------|---------------------------------------|
| Data Length:            | Variable - up to 200 bytes followed by an "" delimiter |                                       |
| Resolution:             | ASCII, 0 offset                                        |                                       |
| Data Range:             | 0 to 255 per byte                                      | Operational Range: same as data range |
| Type:                   | Measured                                               |                                       |
| Supporting Information: |                                                        |                                       |
| PGN reference:          | 64965                                                  |                                       |

**SPN 2911      Halt brake switch**

Switch signal which indicates the position of the halt brake switch.

|    |                           |
|----|---------------------------|
| 00 | Halt brake switch passive |
| 01 | Halt brake switch active  |
| 10 | Error                     |
| 11 | Not available             |

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61441                    |                                       |

**SPN 2912**      **Hill holder mode**

Signal which indicates the current mode of the hill holder function.

|           |                                                                                                 |
|-----------|-------------------------------------------------------------------------------------------------|
| 000       | Inactive                                                                                        |
| 001       | Active                                                                                          |
| 010       | Active, but will change to inactive in a short time. (This mode may be used to warn the driver) |
| 011 - 101 | Reserved                                                                                        |
| 110       | Hill holder not functional                                                                      |
| 111       | Not available                                                                                   |

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 3 bits                   |                                       |
| Resolution:             | 8 states/3 bit, 0 offset |                                       |
| Data Range:             | 0 to 7                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64964                    |                                       |

**SPN 2913**      **Halt brake mode**

Signal which indicates the current mode of the halt brake function.

|           |                                                                                  |
|-----------|----------------------------------------------------------------------------------|
| 000       | Inactive                                                                         |
| 001       | Active                                                                           |
| 010       | Active, but not functioning properly. (This mode may be used to warn the driver) |
| 011 - 101 | Not defined                                                                      |
| 110       | Reserved                                                                         |
| 111       | Not available                                                                    |

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 3 bits                   |                                       |
| Resolution:             | 8 states/3 bit, 0 offset |                                       |
| Data Range:             | 0 to 7                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64964                    |                                       |

**SPN 2914*****XBR EBI Mode***

The XBR EBI (Endurance Brake Integration) Mode is used as an input for the brake system to prescribe the use of endurance brakes like retarders or engine brakes.

00 - No Endurance Brake Integration allowed

The demanded acceleration must be realized by the brake system by using only the foundation brakes. During an active XBR request, the brake system must not actively demand brake torque from other braking devices like retarders or engine brakes.

01 - Only Endurance Brakes allowed

The demanded acceleration must be realized by the brake system by demanding brake torque from other brake devices like retarders or engine brakes. The foundation brake itself must not be used (e.g. to reduce brake lining wear).

10 - Endurance Brake Integration allowed

The demanded acceleration may be realized by the brake system by using the foundation brakes and/or by demanding brake torque from other brake devices like retarders or engine brakes.

11 - Not defined

Data Length: 2 bits

Resolution: 4 states/2 bit, 0 offset

Data Range: 0 to 3

Operational Range: same as data range

Type: Status

Supporting Information:

PGN reference: 1024

**SPN 2915*****XBR Priority***

The XBR Priority is used as an input to the brake system to manage the priority of overlapping external and internal requests.

00 - Highest priority – used for emergency situations, e.g. for future Collision Avoidance System. This mode overrides any brake protection measures of the brake system.

01 - High priority – not defined

10 - Medium priority – used for ACC-Systems. This mode does not override brake protection measures of the brake system.

11 - Low priority – used in "override disabled" XBR Control Mode

Data Length: 2 bits

Resolution: 4 states/2 bit, 0 offset

Data Range: 0 to 3

Operational Range: same as data range

Type: Status

Supporting Information:

PGN reference: 1024

**SPN 2916      XBR Control Mode**

The XBR Control Mode is used as an input to the brake system and defines how the external acceleration demand has to be realized.

- 00 - Override disabled – Disable any existing control commanded by the source of this command.
- 01 - Acceleration control with addition mode - Add the XBR acceleration demand to the driver's acceleration demand.
- 10 - Acceleration control with maximum mode - Execute the XBR acceleration demand if it is higher than the driver's acceleration demand.
- 11 - Not defined

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 1024                     |                                       |

**SPN 2917      XBR System State**

This parameter indicates which external brake control is allowed.

- 00 - Any external brake demand will be accepted (brake system fully operational)
- 01 - Only external brake demand of highest XBR Priority (00) will be accepted (e.g. because the temperature limit of the brake system is exceeded)
- 10 - No external brake demand will be accepted (e.g. because of fault in brake system)
- 11 - not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64964                    |                                       |

**SPN 2918      XBR Active Control Mode**

This parameter indicates which XBR Control Mode is executed by the brake system.

- 0000 No brake demand being executed (default mode)
- 0001 Driver's brake demand being executed, no external brake demand
- 0010 Addition mode of XBR acceleration control being executed
- 0011 Maximum mode of XBR acceleration control being executed
- 0100 - 1110 Reserved for SAE assignment
- 1111 Not available

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64964                     |                                       |

**SPN 2919      Foundation Brake Use**

This parameter indicates if the brake system presently uses the foundation brakes.

00 Foundation brakes not in use  
01 Foundation brakes in use  
10 Reserved  
11 Not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 64964

Operational Range: same as data range

**SPN 2920      External Acceleration Demand**

Parameter provided to the brake system from external sources. This is the acceleration which the brake system is expected to realize. It is specified as an absolute acceleration in reference to the road. Positive values lead to increasing vehicle speed, negative values lead to decreasing vehicle speed. Note: Normally only the negative data range is used, but e.g. in case of downhill driving also positive values are possible.

Data Length: 2 bytes  
Resolution: 1/2048 m/s<sup>2</sup> per bit, -15.687 m/s<sup>2</sup> offset  
Data Range: -15.687 to +15.687 m/s<sup>2</sup>  
Type: Status  
Supporting Information:  
PGN reference: 1024

Operational Range: -10.0 to +10.0 m/s<sup>2</sup>

**SPN 2921      XBR Acceleration Limit**

The brake system may temporarily or generally limit the maximum brake performance available for external systems. A temporary limit may be necessary due to high brake temperature; a general limit may be defined by the vehicle manufacturer, e.g. a value of -2.5 m/s<sup>2</sup> due to liability reasons. The actual limit is communicated to the external systems that request braking. The limit is only effective in the XBR Priorities 01 to 11. It is specified as an absolute acceleration in reference to the road.

Data Length: 1 byte  
Resolution: 0.1 m/s<sup>2</sup> per bit, -12.5 m/s<sup>2</sup> offset  
Data Range: -12.5 to +12.5 m/s<sup>2</sup>  
Type: Status  
Supporting Information:  
PGN reference: 64964

Operational Range: -10.0 to +10.0 m/s<sup>2</sup>

**SPN 2922      Steerable Lift Axle Lowering Inhibit**

A signal which indicates if lowering of lifted axle is allowed or inhibited.

|    |                    |
|----|--------------------|
| 00 | Lowering allowed   |
| 01 | Lowering inhibited |
| 10 | Reserved           |
| 11 | Not available      |

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        61451

Operational Range: same as data range

**SPN 2923      Status of Steering Axle**

A signal which indicates different states of the steering axle

|           |                                                             |
|-----------|-------------------------------------------------------------|
| 0000      | Axle steering not active (adhesion steering)                |
| 0001      | Axle steering active                                        |
| 0010      | Axle centered                                               |
| 0011      | Axle centered, because of an error                          |
| 0100      | Axle not active because of an error (adhesion steering)     |
| 0101      | Axle steering in special mode (diagnosis, calibration mode) |
| 0110-1110 | Reserved for SAE Assignment                                 |
| 1111      | Not available                                               |

Data Length:            4 bits  
Resolution:            16 states/4 bit, 0 offset  
Data Range:            0 to 15  
Type:                    Status  
Supporting Information:  
PGN reference:        61451

Operational Range: same as data range

**SPN 2924      Steering Type**

Indicates the different types of steering systems (ref. ECE Regulation 79 paragraph 2.5)

|           |                                |
|-----------|--------------------------------|
| 0000      | Main steering system           |
| 0001      | Auxiliary steering equipment   |
| 0010-1110 | Reserved for Assignment by SAE |
| 1111      | Not Available                  |

0000 Main steering system - The steering equipment of a vehicle which is mainly responsible for determining the direction of travel.

0001 Auxiliary steering equipment - A system in which the wheels on axle(s) of vehicles of categories M and N are steered in addition to the wheels of the main steering equipment in the same or opposite direction to those of the main steering equipment and/or the steering angle of the front and/or the rear wheels may be adjusted relative to vehicle behaviour.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 61451                     |                                       |

**SPN 2925      Type of Steering Forces**

Type of Steering Forces (Ref. ECE Regulation 79 paragraph 2.5)

|           |                                   |
|-----------|-----------------------------------|
| 0000      | Manual steering equipment         |
| 0001      | Power assisted steering equipment |
| 0010      | Full power steering equipment     |
| 0011      | Self tracking steering equipment  |
| 0100-1110 | Reserved for SAE assignment       |
| 1111      | Not Available                     |

0000 Manual steering equipment - The steering forces result solely from the muscular effort of the driver.

0001 Power assisted steering equipment - The steering forces result from both the muscular effort of the driver and the energy supply or supplies.

0010 Full power steering equipment - The steering forces are provided solely by one or more energy supplies.

0011 Self tracking steering equipment - A system designed to create a change of steering angle on one or more wheels only when acted upon by forces and/or moments applied through the tire to road contact.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 61451                     |                                       |

**SPN 2926      *Type of Steering Transmission***

Type of Steering Transmission (Ref. ECE Regulation 79 paragraph 2.6)

|           |                                         |
|-----------|-----------------------------------------|
| 0000      | Purely mechanical steering transmission |
| 0001      | Purely hydraulic steering transmission  |
| 0010      | Purely electric steering transmission   |
| 0011      | Hybrid steering transmission            |
| 0100-1110 | Reserved for SAE assignment             |
| 1111      | Not available                           |

0000 Purely mechanical steering transmission - A steering transmission in which the steering forces are transmitted entirely by mechanical means.

0001 Purely hydraulic steering transmission - A steering transmission in which the steering forces, somewhere in the transmission, are transmitted only by hydraulic means.

0010 Purely electric steering transmission - A steering transmission in which the steering forces, somewhere in the transmission, are transmitted only through electric means.

0011 Hybrid steering transmission - A steering transmission in which part of the steering forces is transmitted through one and the other part through another of the above mentioned means. However, in the case where any mechanical part of the transmission is designed only to give position feedback and is too weak to transmit the total sum of the steering forces, this system shall be considered to be purely hydraulic or purely electric steering transmission.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 61451                     |                                       |

**SPN 2927      *Actual Inner wheel steering angle***

Signal which indicates the actual inner wheel steering angle. See Figure SPN2927\_A for explanation of positive and negative angles.

|                         |                                |                                       |
|-------------------------|--------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                        |                                       |
| Resolution:             | 1/256 deg/bit, -125 deg offset |                                       |
| Data Range:             | -125 to 125 deg                | Operational Range: same as data range |
| Type:                   | Measured                       |                                       |
| Supporting Information: | See Appendix D - SPN 2927      |                                       |
| PGN reference:          | 61451                          |                                       |



**SPN 2928      Axle Location**

To identify to which of several similar devices (such as tires or fuel tanks) the information applies.

The low order 4 bits represent a position number, counting left to right when facing in the direction of normal vehicle travel (forward).

The high order 4 bits represent a position number, counting front to back on the vehicle.

The value 0xFF indicates not available.

It is recommended that output devices add 1 to the position number (range 1 to 15, not 0 to 14) for use by drivers and service technicians.

Examples: Tire pressure for location 0x00 would be left front tire.

Tire pressure for location 0x23 would be right outside rear rear on a 3-axle tractor with dual axle per side (3rd axle, 4th tire).

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 8 bits                     |                                       |
| Resolution:             | 256 states/8 bit, 0 offset |                                       |
| Data Range:             | 0 to 255                   | Operational Range: same as data range |
| Type:                   | Measured                   |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 61451                      |                                       |

**SPN 2930      Hydraulic Brake System Audible Warning Command**

Signal which commands an audible warning by the hydraulic braking system.

|    |                     |
|----|---------------------|
| 00 | Audible warning off |
| 01 | Audible warning on  |
| 10 | Reserved            |
| 11 | Don't care          |

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64998                    |                                       |

**SPN 2931      Hydraulic Brake Fluid Level Switch**

Signal which indicates whether the hydraulic fluid level in the reservoir(s) is sufficient.

- 00    Fluid level is not sufficient
- 01    Fluid level is sufficient
- 10    Error indicator
- 11    Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64998

Operational Range: same as data range

**SPN 2945      Active Shift Console Indicator**

Signal from transmission control unit indicating which shift console (primary or secondary) it currently considers as the active shift selector input.

- 00    Primary shift console is active
- 01    Secondary shift console is active
- 10    Reserved
- 11    Not available

Note: In some applications such as refuse trucks, the transmission can be operated from two positions in the vehicle. The transmission control unit will accept changes in transmission requested gear (SPN 525) from the operator only from the active shift console. The transmission control unit determines which shift console is active based on a switch input controlled by the operator and transmission system state criteria.

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65098

Operational Range: same as data range

**SPN 2948      Engine Intake Valve Actuation System Oil Pressure**

The gage pressure of the oil in the hydraulic system that powers the engine intake valve actuation system

Data Length:            2 bytes  
Resolution:            1/256 MPa/bit, 0 offset  
Data Range:            0 to 251 MPa  
Type:                    Measured  
Supporting Information:  
PGN reference:        64961

Operational Range: same as data range

**SPN 2970      Accelerator Pedal 2 Low Idle Switch**

Switch signal which indicates the state of the accelerator pedal 2 low idle switch. The low idle switch is defined in SAE J1843.

- 00 Accelerator pedal 2 not in low idle condition
- 01 Accelerator pedal 2 in low idle condition
- 10 Error
- 11 Not available

Note: Also refer to SPN 558 Accelerator Pedal 1 Low Idle Switch and SPN 2971 Accelerator Pedal 3 Low Idle Switch.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61443                    |                                       |

**SPN 2978      Estimated Engine Parasitic Losses - Percent Torque**

The calculated torque that indicates the estimated amount of torque loss due to engine parasitics, such as cooling fan, air compressor, air conditioning, etc. It is expressed as a percent of Engine Reference Torque.

When the data value of this parameter is equal to FB it means that all parasitic losses calculated by the engine are included in the Engine's Nominal Friction Percent Torque (SPN 514).

|                         |                        |                              |
|-------------------------|------------------------|------------------------------|
| Data Length:            | 1 byte                 |                              |
| Resolution:             | 1 %/bit, -125 % offset |                              |
| Data Range:             | -125 to 125 %          | Operational Range: 0 to 125% |
| Type:                   | Status                 |                              |
| Supporting Information: |                        |                              |
| PGN reference:          | 65247                  |                              |

**SPN 2979      Vehicle Acceleration Rate Limit Status**

Status (active or not active) of the system used to limit maximum forward vehicle acceleration.

- 00 Limit not active
- 01 Limit active
- 10 Reserved
- 11 Not available

NOTE: The effects of emission control limits, such as engine exhaust smoke control, are specifically excluded; they are not considered to be part of a function to limit vehicle acceleration.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61443                    |                                       |

**SPN 2980      Engine Fuel Valve 1 Outlet Absolute Pressure**

Absolute Pressure of gas on outlet side of the first or only fuel system control valve. See SPN 3469 for the second fuel control valve.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65163                 |                                       |

**SPN 2983      Clutch Life Remaining**

Signal which indicates the actual clutch life remaining in percent. One hundred percent means the clutch is brand new and zero percent means the clutch is at the end of its life.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65195               |                                       |

**SPN 2984      Automatic traction help (load transfer)**

This signal enables the traction help (load transfer) in case of an active ASR function

00 Disable automatic traction help  
01 Enable automatic traction help  
10 Reserved  
11 Don't care

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 53760                    |                                       |

**SPN 2985      *Transmission Shift Selector Display Mode Switch***

Status of the operator's switch used to 'toggle' through multiple display modes of a shift selector display.

When a shift selector display is capable of displaying more than just range information, this switch is toggled by the operator to move through the different display modes. If the selector has only two display modes, this switch may behave as a typical SPST switch. If the selector has more than two display modes, the switch may be momentary, where each activation indicates that the selector has scrolled through to the next subsequent display mode.

00 Off  
01 On  
10 Error  
11 Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 256                      |                                       |

**SPN 2986      *Engine Intake Valve Actuation System Oil Temperature***

The temperature of the oil in the hydraulic system that powers the intake valve actuation system.

|                         |                                      |                                       |
|-------------------------|--------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                              |                                       |
| Resolution:             | 0.03125 deg C/bit, -273 deg C offset |                                       |
| Data Range:             | -273 to 1734.96875 deg C             | Operational Range: same as data range |
| Type:                   | Measured                             |                                       |
| Supporting Information: |                                      |                                       |
| PGN reference:          | 65129                                |                                       |

**SPN 3026      *Transmission Oil Level Measurement Status***

Indicates if conditions are acceptable to obtain a valid transmission oil level measurement as conveyed in SPN 124 Transmission Oil Level or SPN 3027 Transmission Oil Level High / Low. If conditions are not acceptable, this parameter conveys to the operator what prevents conditions from being acceptable. Only one condition can be conveyed in this parameter at any given point in time. If multiple conditions exist, it is not important which condition is actually broadcast, as the driver must 'correct' each and every condition as it is presented before a valid oil level reading can be made. If multiple conditions exist that prevent a valid reading, the sender should broadcast one of those conditions until it is corrected; then the next condition can be conveyed to the operator, and so on.

0000 Conditions valid for transmission oil level measurement  
0001 Conditions not valid – Settling timer still counting down  
0010 Conditions not valid – Transmission in gear  
0011 Conditions not valid – Transmission fluid temperature too low  
0100 Conditions not valid – Transmission fluid temperature too high  
0101 Conditions not valid – Vehicle moving; output shaft speed too high  
0110 Conditions not valid – Vehicle not level  
0111 Conditions not valid – Engine speed too low  
1000 Conditions not valid – Engine speed too high  
1001 Conditions not valid – No request for reading  
1010 Not defined  
1011 Not defined  
1100 Not defined  
1101 Conditions not valid - Other  
1110 Error  
1111 Not available

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 65272                     |                                       |

**SPN 3027      *Transmission Oil Level High / Low***

Amount of current volume of transmission sump oil compared to recommended volume. Positive values indicate overfill. Zero means the transmission fluid is filled to the recommended level.

Parameter Specific Indicator:

A value of FB hex indicates conditions are not acceptable for a valid fluid level measurement.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 1 bytes                   |                                       |
| Resolution:             | 0.5 L/bit, -62.5 L offset |                                       |
| Data Range:             | -62.5 to 62.5 L           | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 65272                     |                                       |

**SPN 3028      *Transmission Oil Level Countdown Timer***

Once all vehicle conditions (such as vehicle stopped, etc) are met, some transmissions may require a 'settling time' to allow the fluid level to normalize. This parameter indicates how much of the required settling time remains. When time reaches 0, a valid oil level measurement value will be broadcast in SPN 3027 Transmission Oil Level High / Low.

0000 less than 1 minute  
0001 One minute  
0010 Two minutes  
0011 Three minutes  
0100 Four minutes  
0101 Five minutes  
0110 Six minutes  
0111 Seven minutes  
1000 Eight minutes  
1001 Nine minutes  
1010 Ten minutes  
1011 Eleven minutes  
1100 Twelve minutes  
1101 Thirteen minutes  
1110 Error  
1111 Not Available

|                         |                           |                                    |
|-------------------------|---------------------------|------------------------------------|
| Data Length:            | 4 bits                    |                                    |
| Resolution:             | 16 states/4 bit, 0 offset |                                    |
| Data Range:             | 0 to 15                   | Operational Range: 0 to 13 minutes |
| Type:                   | Measured                  |                                    |
| Supporting Information: |                           |                                    |
| PGN reference:          | 65272                     |                                    |

**SPN 3030      *Transmission Torque Converter Ratio***

Ratio of the transmissions torque converter output torque to torque converter input torque at current speed.

The ratio of 1.000 ( 03 E8 hex ) indicates torque converter lockup.

If the ratio is less than 1 and the ratio can not be properly determined it shall be set to a value of FB00 hex.

Ratios above 1 indicate torque converter multiplication.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 2 bytes             |                                       |
| Resolution:             | 0.001/bit, 0 offset |                                       |
| Data Range:             | 0 to 64.255         | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 61452               |                                       |

**SPN 3031      *Aftertreatment 1 SCR Catalyst Tank Temperature***

Temperature of the reagent in the storage tank.

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 deg C/bit, -40 deg C offset |                                       |
| Data Range:             | -40 to 210 deg C              | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: | See Appendix D - SPN 1761     |                                       |
| PGN reference:          | 65110                         |                                       |

**SPN 3043      *Type of Passenger Count***

Used to notify transit link devices of the type of passenger counting system used in the vehicle. Some passenger counting systems indicate real-time boarding and exiting data for other devices to accumulate. Other types of passenger counters report a current on-board total relative to a transit door status, a fare collection status, or other signal which can define the end of the boarding/exiting period and a stable underway totalized passenger count.

0 - absolute passenger count  
1 - boarding passenger  
2 - exiting passenger  
3 - boarding passenger (second passenger stream)  
4 - exiting passenger (second passenger stream)  
5 to 250 - reserved for future assignment  
251 to 253 - reserved  
254 - error indicator  
255 - not available

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 8 bits                     |                                       |
| Resolution:             | 256 states/8 bit, 0 offset |                                       |
| Data Range:             | 0 to 255                   | Operational Range: same as data range |
| Type:                   | Measured                   |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 64960                      |                                       |

**SPN 3044      *Silent Alarm Status***

Used to report silent alarm push button status.

00 - Off  
01 - On  
10 - Error condition  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64960                    |                                       |



**SPN 3045      Vehicle Use Status**

Used to indicate the proper or unauthorized use of the vehicle. The administrative control device or any device issuing the vehicle use status PID should be sensitive to the run switch status (SPN 3046) and any other locally defined criteria for authorized use (i.e., driver log-ons) before the vehicle use status PID is used to generate an unauthorized use alarm.

00 - Normal use  
01 - Unauthorized use  
10 - Error condition  
11 - Not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 64960

Operational Range: same as data range

**SPN 3046      Transit Run Status**

Status of the run switch for the vehicle.

00 - Off  
01- On  
10 - Error condition  
11 - Not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 64960

Operational Range: same as data range

**SPN 3047      Patron Count**

Count of the number of passengers on a transit vehicle. If the type of passenger count (SPN 3043) is 0, the patron count indicates the number of patrons currently on vehicle after the door has closed. If the type of passenger count is 1 to 4, the patron count indicates an incremental count of passengers since the last data transmittal.

Data Length: 1 byte  
Resolution: 1 count/bit, 0 offset  
Data Range: 0 to 250  
Type: Measured  
Supporting Information:  
PGN reference: 64960

Operational Range: same as data range

**(R) SPN 3070      *Number of bytes in the Milepost Identification***

Number of bytes in the Milepost Identification. This parameter identifies the length, in bytes, of the data in SPN 590 (Milepost Identification).

|                         |                      |                                   |
|-------------------------|----------------------|-----------------------------------|
| Data Length:            | 1 byte               |                                   |
| Resolution:             | 1 byte/bit, 0 offset |                                   |
| Data Range:             | 0 to 250             | Operational Range: 0 to 100 bytes |
| Type:                   | Measured             |                                   |
| Supporting Information: |                      |                                   |
| PGN reference:          | 64959                |                                   |

**(R) SPN 3071      *Number of bytes in the Transit Assigned Route Identity***

Number of bytes in the Transit Assigned Route Identity. This parameter identifies the length, in bytes, of the data in SPN 3074 (Transit Assigned Route Identity).

|                         |                      |                                   |
|-------------------------|----------------------|-----------------------------------|
| Data Length:            | 1 byte               |                                   |
| Resolution:             | 1 byte/bit, 0 offset |                                   |
| Data Range:             | 0 to 250             | Operational Range: 1 to 100 bytes |
| Type:                   | Measured             |                                   |
| Supporting Information: |                      |                                   |
| PGN reference:          | 64958                |                                   |

**(R) SPN 3072      *Number of bytes in the Transit Assigned Run Identity***

Number of bytes in the Transit Assigned Run Identity. This parameter identifies the length, in bytes, of the data in SPN 3075 (Transit Assigned Run Identity).

|                         |                      |                                   |
|-------------------------|----------------------|-----------------------------------|
| Data Length:            | 1 byte               |                                   |
| Resolution:             | 1 byte/bit, 0 offset |                                   |
| Data Range:             | 0 to 250             | Operational Range: 1 to 100 bytes |
| Type:                   | Measured             |                                   |
| Supporting Information: |                      |                                   |
| PGN reference:          | 64958                |                                   |

**(R) SPN 3073      *Number of bytes in the Transit Assigned Block Identity***

Number of bytes in the Transit Assigned Block Identity. This parameter identifies the length, in bytes, of the data in SPN 3076 (Transit Assigned Block Identity).

|                         |                      |                                   |
|-------------------------|----------------------|-----------------------------------|
| Data Length:            | 1 byte               |                                   |
| Resolution:             | 1 byte/bit, 0 offset |                                   |
| Data Range:             | 0 to 250             | Operational Range: 1 to 100 bytes |
| Type:                   | Measured             |                                   |
| Supporting Information: |                      |                                   |
| PGN reference:          | 64958                |                                   |

**(R) SPN 3074      *Transit Assigned Route Identity***

Identifies the transit route assigned to a specific vehicle. The length of the ASCII text for this parameter must be reported using SPN 3071 (Number of bytes in the Transit Assigned Route Identity).

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | Variable - up to 100 bytes |                                       |
| Resolution:             | ASCII, 0 offset            |                                       |
| Data Range:             | 0 to 255 per byte          | Operational Range: same as data range |
| Type:                   | Measured                   |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 64958                      |                                       |

**(R) SPN 3075      *Transit Assigned Run Identity***

Identifies the transit run assigned to a specific vehicle. The length of the ASCII text for this parameter must be reported using SPN 3073 (Number of bytes in the Transit Assigned Run Identity).

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | Variable - up to 100 bytes |                                       |
| Resolution:             | ASCII, 0 offset            |                                       |
| Data Range:             | 0 to 255 per byte          | Operational Range: same as data range |
| Type:                   | Measured                   |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 64958                      |                                       |

**(R) SPN 3076      *Transit Assigned Block Identity***

Identifies the transit block assigned to a specific vehicle. The length of the ASCII text for this parameter must be reported using SPN 3073 (Number of bytes in the Transit Assigned Block Identity).

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | Variable - up to 100 bytes |                                       |
| Resolution:             | ASCII, 0 offset            |                                       |
| Data Range:             | 0 to 255 per byte          | Operational Range: same as data range |
| Type:                   | Measured                   |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 64958                      |                                       |

**SPN 3078      *Agency***

The identity of the agency involved in this transaction

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 1 byte                |                                       |
| Resolution:             | 1 count/bit, 0 offset |                                       |
| Data Range:             | 0 to 255              | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64958                 |                                       |

**SPN 3079      Intersection Preemption Request/Response**

Status of the intersection signal preemption

- 00 - Message is a request directed to the emitter
- 01 - Message is a response from the emitter
- 10 - Error condition
- 11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64957                    |                                       |

**SPN 3080      Transit Route ID Usage**

Transit route ID usage

- 00 - Transit route ID not used for interleaved data
- 01 - Transit route ID used for interleaved data (if range code not enabled)
- 10 - Error condition
- 11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64957                    |                                       |

**SPN 3081      Range Code Enable**

Range code enable

- 00 - Range code not used for interleaved data
- 01 - Range code used for interleaved data
- 10 - Error condition
- 11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64957                    |                                       |

**SPN 3082      Strobe Activation Control Status**

Strobe activation control status

- 00 - Deactivate strobe
- 01 - Activate strobe
- 10 - Error condition
- 11 - Not available

Note: Strobe will flash if not overridden by transit door status, strobe is working, and emitter is in the normal mode.

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64957

Operational Range: same as data range

**SPN 3083      Transit Door Enable**

Transit door enable

- 00 - Ignore transit door status
- 01 - Transit door status will override strobe activation
- 10 - Error condition
- 11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64957

Operational Range: same as data range

**SPN 3084**      **Priority of Response Sent by Emitter**

Priority of response sent by emitter

|              |                                              |
|--------------|----------------------------------------------|
| 0000         | - Reserved                                   |
| 0001         | - Low priority                               |
| 0010         | - Probe priority                             |
| 0011         | - High priority                              |
| 0100 to 1000 | - Reserved                                   |
| 1001         | - Priority set by hardware to low priority   |
| 1010         | - Priority set by hardware to probe priority |
| 1011         | - Priority set by hardware to high priority  |
| 1100 to 1101 | - Reserved                                   |
| 1110         | - Error condition                            |
| 1111         | - Not available                              |

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64957                     |                                       |

**SPN 3085**      **Vehicle ID**

Numerical designation of the vehicle. 65535 is used to represent the vehicle ID is not available.

|                         |                       |                                |
|-------------------------|-----------------------|--------------------------------|
| Data Length:            | 2 bytes               |                                |
| Resolution:             | 1 count/bit, 0 offset |                                |
| Data Range:             | 0 to 65,535 counts    | Operational Range: 0 to 65,534 |
| Type:                   | Measured              |                                |
| Supporting Information: |                       |                                |
| PGN reference:          | 64957                 |                                |

**(R) SPN 3086**      **Transmission Ready for Brake Release**

This parameter indicates that enough torque / motive force is available at the transmission output shaft to release all the brakes without a risk of unintentional movement in the opposite direction.

00 - Transmission Not Ready for Brake Release  
01 - Transmission Ready for Brake Release  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65098                    |                                       |

**SPN 3087      Auxiliary Level**

Level measured by a sensor.

|                         |                                 |                                       |
|-------------------------|---------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                         |                                       |
| Resolution:             | 0.1 mm/bit, 0 offset            |                                       |
| Data Range:             | 0 to 6,425.5 mm (0 to 6.4255 m) | Operational Range: same as data range |
| Type:                   | Measured                        |                                       |
| Supporting Information: |                                 |                                       |
| PGN reference:          | 65164                           |                                       |

**SPN 3156****Blade Control Mode Switch**

This parameter indicates the blade control mode switch state the user has set for the land leveling system. The switch value directly correlates to the current switch state, regardless of the switch being used. This parameter is intended for use in systems using only one parameter to control the blade movement (i.e. elevation). Systems using two independent parameters to control blade position, i.e. one blade edge maintains a constant elevation and the other blade edge maintains a constant blade angle, should use parameters specific to that usage. Only one of the following states will be active at a time. Below are the data values defined for each switch type that may be used in this application. The purpose of the following switch information is to define what data should be reported based on what type of switch is used.

1. A toggle button with two states can be used, in which the button is either in the manual or the auto position at all times. Toggle button usage is as follows:

Manual Position = 0010 Manual button pressed  
Auto Position = 0011 Automatic button pressed

2. The momentary rocker switch may be used, where the default is the no button pressed position. The user can press the rocker into the manual position, and when pressure is released, it will return to the no button pressed position. The user may also press the rocker into the auto position, and when pressure is released, it will return to the no button pressed position. Momentary rocker button usage is as follows:

No Button Pressed = 0000 No button pressed  
Manual Button Pressed = 0010 Manual button pressed  
Auto Button Pressed = 0011 Automatic button pressed

3. The momentary contact button pair may be used, where the default is no buttons being pressed. The user can press the manual button, and when pressure is released, it will return to the no button pressed position. The user may press the auto button, and when pressure is released, it will return to the no button pressed position. Momentary contact buttons (button pair) usage is as follows:

No Button Pressed = 0000 No button pressed  
Manual Button Pressed = 0010 Manual button pressed  
Auto Button Pressed = 0011 Automatic button pressed

4. The momentary contact single button may be used, where the default is no button being pressed. The user can press the button, which is the button pressed position, and when pressure is released, it will return to the no button pressed position. The controller receiving this command will keep track of what mode the blade is in, auto or manual. When the button is pressed, the "mode button pressed" state is reported and the receiving controller then changes the current mode to its opposite value (i.e. manual to automatic or vice-versa). Momentary contact button (single button) usage is as follows:

No Button Pressed = 0000 No button pressed  
Button Pressed = 0001 Mode button pressed

**Data Values and Descriptions:**

0000 No button pressed  
0001 Mode button pressed  
0010 Manual button pressed  
0011 Automatic button pressed  
1110 Error Indicator  
1111 Not Installed  
All other values are reserved

**Notes:**

1. The switch state can be read in two ways. One method uses the direct analog switch input to determine the switch state, while the second method relies on a secondary control to read the analog input, then relay the information on the data link. The parameter is designed to provide the actual switch state to other controls that need the information.
2. Other systems with automated blade controls should be able to use this parameter, since it is a measured switch value.



|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 61453                     |                                       |

**SPN 3157*****Desired Grade Offset Switch***

This parameter indicates the grade offset switch state the user has set for the land leveling system. The desired grade offset value is the vertical offset measured from a given elevation reference point to the bottom edge of the blade. This parameter is intended for use in systems using only elevation offset to control the blade movement (i.e. elevation). Systems using two independent parameters to control blade position, i.e. one edge maintains a constant elevation and the other blade edge maintains a constant angle, should use parameters specific to that usage. Only one of the following states will be active at a time. Below are the data values defined for each switch type that may be used in this application. The purpose of the following switch information is to define what data should be reported based on what type of switch is used.

1. The momentary rocker switch may be used, where the default is the no button pressed position. The user can press the rocker into the increment button pressed position, and when pressure is released, it will return to the no button pressed position. The user may also press the rocker into the decrement button pressed position, and when pressure is released, it will return to the no button pressed position. Momentary rocker button usage is as follows:

No Button Pressed = 0000 No button pressed  
Increment Button Pressed = 0001 Increment button pressed  
Decrement Button Pressed = 0010 Decrement button pressed

2. The momentary contact button pair may be used, where the default is the no buttons pressed position. The user can press the increment button, and when pressure is released, it will return to the no buttons pressed position. The user may press the decrement button, and when pressure is released, it will return to the no buttons pressed position. Momentary contact button (button pair) usage is as follows:

No Button Pressed = 0000 No button pressed  
Increment Button Pressed = 0001 Increment button pressed  
Decrement Button Pressed = 0010 Decrement button pressed

**Data Values and Descriptions:**

0000 No button pressed  
0001 Increment button pressed  
0010 Decrement button pressed  
1110 Error Indicator  
1111 Not installed  
All other values are reserved

**Notes:**

1. The switch state can be read in two ways. One method uses the direct analog switch input to determine the switch state, while the second method relies on a secondary control to read the analog input, then relay the information on the data link. The parameter is designed to provide the actual switch state to other controls that need the information.
2. Other systems with automated blade controls should be able to use this parameter, since it is a measured switch value.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 61453                     |                                       |

**SPN 3158****Blade Auto Mode Command**

Allows other controllers to command to the primary control system what they think is the appropriate auto control mode to be engaged in, based on the information they have available to them. When in automatic mode, the blade automatically adjusts its position to the center of the blade to maintain a desired grade offset. Only one of the following states will be active at a time. Below is extended information describing each command. The purpose of this information is to define what command state should be reported based on what auto control mode command is deemed appropriate by the operational specifications of the system.

0000 Auto Allowed - Auto mode permitted as appropriate (auto button was pushed or directly returned from Suspend Auto condition)

0001 Activity Allows Auto - Auto mode permitted only if the primary control system detects operator activity. The control issuing this command does not have sufficient information/reason to absolutely allow Auto mode (state 0000) or not allow Auto mode (state 0100). The control issuing this command is permitting the primary control system to operate in auto mode only if the primary control system detects operator activity, such as direct input to the primary control system. If the primary control system does not detect operator activity, then the control issuing this command is not allowing auto mode. For example, the control issuing this command has detected no operator activity yet it acknowledges that there may be other sources of operator activity that might make auto mode permissible.

0010 Suspend Auto - Auto mode is temporarily not allowed and the control issuing this command wants the primary control system to automatically return to the previous state (Auto or Manual) when the suspend auto condition is removed.

0011 Service Mode - Auto mode is permitted only for special services such as calibrations.

0100 Auto Not Allowed - Auto mode is not allowed under any condition

**Data Values and Descriptions:**

0000 Auto Allowed

0001 Activity Allows Auto - must detect operator before auto allowed

0010 Suspend Auto - temporarily suspend auto mode

0011 Service Mode - auto allowed only during service modes

0100 Auto Not Allowed

1110 Error Indicator

1111 Not Supported

All other values are reserved

**Note:**

The control issuing this command is aware that it does not have access to all information that the primary controller of the Land Leveling System attachment has access to. Therefore, it commands the Land Leveling system to activate a auto blade mode based on the input it has access to. In some cases, like in the "Activity Allows Auto" situation, the control knows the Land Leveling system has access to an additional display (which has switches and several buttons) which may help determine if an operator is present. On the other hand, the control may also have information the primary controller of the Land Leveling System does not have access to, like the parking brake status.

Data Length: 4 bits

Resolution: 16 states/4 bit, 0 offset

Data Range: 0 to 15

Type: Status

Supporting Information:

PGN reference: 61453

Operational Range: same as data range

**SPN 3159**      ***Trip Number***

The identity number assigned to this trip.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 1 count/bit, 0 offset |                                       |
| Data Range:             | 0 to 65,535 counts    | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64956                 |                                       |

**SPN 3160**      ***Assigned Route***

The identity number assigned to this route.

Note: This is the numerical value for the route as opposed to the "Transit Assigned Route Identity" (SPN 3074) which is variable length ASCII or the "Route number" (SPN 3169) which is 12 bit numeric.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 1 count/bit, 0 offset |                                       |
| Data Range:             | 0 to 65,535 counts    | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64956                 |                                       |

**SPN 3161**      ***Pattern Number***

The agency defined pattern number for this trip

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 1 count/bit, 0 offset |                                       |
| Data Range:             | 0 to 65,535 counts    | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64956                 |                                       |

**SPN 3162**      ***Assigned Run***

The agency defined run number for this trip

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 1 count/bit, 0 offset |                                       |
| Data Range:             | 0 to 65,535 counts    | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64956                 |                                       |

**SPN 3163      *Assigned Block***

The agency defined block number for this trip

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 1 count/bit, 0 offset |                                       |
| Data Range:             | 0 to 65,535 counts    | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64956                 |                                       |

**SPN 3164      *Driver's farebox security code***

Security code for the farebox, numerical only.

Note: 0 = Farebox is in reporting status  
1 - 65535 = security code

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 1 count/bit, 0 offset |                                       |
| Data Range:             | 0 to 65,535 counts    | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64956                 |                                       |

**SPN 3165      *Fare Validity***

Agency defined value indicating validity of this fare

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 4 bits                |                                       |
| Resolution:             | 1 count/bit, 0 offset |                                       |
| Data Range:             | 0 to 15               | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64955                 |                                       |

**SPN 3166      *Pass Category***

Agency defined value indicating the category of the passenger associated with this fare

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 4 bits                |                                       |
| Resolution:             | 1 count/bit, 0 offset |                                       |
| Data Range:             | 0 to 15               | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64955                 |                                       |

**SPN 3167      Initial Fare Agency**

Identifies where the initial fare is paid

Note: The definition of the agency numbering plan shall be agreed by the operating agency and the farebox manufacturer. The value of 0 is reserved, the usable range is 1 to 31.

|                         |                       |                            |
|-------------------------|-----------------------|----------------------------|
| Data Length:            | 5 bits                |                            |
| Resolution:             | 1 count/bit, 0 offset |                            |
| Data Range:             | 0 to 31               | Operational Range: 1 to 31 |
| Type:                   | Measured              |                            |
| Supporting Information: |                       |                            |
| PGN reference:          | 64955                 |                            |

**SPN 3168      Transfer Sold**

Indicates that a transfer was sold or issued on this transaction including its type and/or restrictions. The final definitions of the transfer issued information shall be agreed by the operating agency and the farebox manufacturer.

Note: A non-zero value indicates that a transfer was sold or issued. The value of zero is reserved to indicate that no transfer has been sold or issued.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 1 byte                |                                       |
| Resolution:             | 1 count/bit, 0 offset |                                       |
| Data Range:             | 0 to 255              | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64955                 |                                       |

**SPN 3169      Route Number**

The route number issuing the transfer.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 12 bits               |                                       |
| Resolution:             | 1 count/bit, 0 offset |                                       |
| Data Range:             | 0 to 4095             | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64955                 |                                       |

**SPN 3170      Transaction Type**

Enumerated value representing the type of transaction completed

0000 = Cash  
0001 = Token  
0010 = Ticket  
0011 = Pass  
0100 = Card  
0101 = Permit  
0110 = Transfer  
0111 = Free  
1000-1011 = Reserved for assignment  
1100-1111 = Agency defined

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64955                     |                                       |

**SPN 3171      Passenger Type**

Enumerated value representing the type/class of passenger, as defined by the agency.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64955                     |                                       |

**SPN 3172      Type of Service**

The type of service provided

000 = Local service  
001 = Express service  
010-111 = Agency defined

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 3 bits                   |                                       |
| Resolution:             | 8 states/3 bit, 0 offset |                                       |
| Data Range:             | 0 to 7                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64955                    |                                       |

**SPN 3173      Transfer Type**

The kind of transfer used

00000 = North  
00001 = South  
00010 = East  
00011 = West  
00100 = In  
00101 = Out  
00110-11111 = Agency defined

Data Length:            5 bits  
Resolution:            32 states/5 bit, 0 offset  
Data Range:            0 to 31  
Type:                    Measured  
Supporting Information:  
PGN reference:        64955

Operational Range: same as data range

**SPN 3174      Trip Direction**

The general direction of travel for this trip.

0000 = North  
0001 = South  
0010 = East  
0011 = West  
0100 = In  
0101 = Out  
0110-1111 = Agency defined

Data Length:            4 bits  
Resolution:            16 states/4 bit, 0 offset  
Data Range:            0 to 15  
Type:                    Measured  
Supporting Information:  
PGN reference:        64956

Operational Range: same as data range

**SPN 3175      Fare Presets**

Fare Presets

00000000 to 00001111 = Agency defined  
00010000 to 11111111 = Reserved for assignment

Data Length:            8 bits  
Resolution:            256 states/8 bit, 0 offset  
Data Range:            0 to 255  
Type:                    Measured  
Supporting Information:  
PGN reference:        64956

Operational Range: same as data range



**SPN 3176      Type of Fare**

## Type of Fare

0000 = Cash/No detail  
0001 = Token A  
0010 = Token B  
0011 = Ticket A  
0100 = Ticket B  
0101 = Pass A  
0110 = Pass B  
0111-1010 = Reserved for assignment  
1011-1111 = Agency defined

Data Length:            4 bits  
Resolution:            16 states/4 bit, 0 offset  
Data Range:            0 to 15  
Type:                    Measured  
Supporting Information:  
PGN reference:        64955

Operational Range: same as data range

**SPN 3177      Payment Details**

## Payment details.

0000 = Not an upgrade  
0001 = Cash  
0010 = Token  
0011 = Ticket  
0100 = Pass  
0101 = Card  
0110-1010 = Reserved for assignment  
1011-1111 = Agency defined

Data Length:            4 bits  
Resolution:            16 states/4 bit, 0 offset  
Data Range:            0 to 15  
Type:                    Measured  
Supporting Information:  
PGN reference:        64955

Operational Range: same as data range

**SPN 3178      Farebox Service Status**

Indicates if the farebox is in or out of service.

00 = Farebox out of service  
01 = Farebox in service  
10 = Error Condition  
11 = Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64956

Operational Range: same as data range

**SPN 3179      Farebox Emergency Status**

Indicates if a farebox emergency condition exists.

00 = Non-emergency condition  
01 = Emergency condition  
10 = Error Condition  
11 = Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64954

Operational Range: same as data range

**SPN 3180      Trip Status**

Trip Status

000 = Undefined  
001 = Trip start  
010 = Trip end  
011 = Undefined  
100 = Undefined  
101 = Layover start  
110 = Layover end  
111 = Undefined

Data Length:            3 bits  
Resolution:            8 states/3 bit, 0 offset  
Data Range:            0 to 7  
Type:                    Measured  
Supporting Information:  
PGN reference:        64956

Operational Range: same as data range

**SPN 3181*****Farebox Alarm Identifier***

Indicates the nature of the farebox alarm condition.

0000000 = Voltage dropout  
0000001 = Voltage restored  
0000010 = Probe started  
0000011 = Probe completed  
0000100 = Cashbox removed  
0000101 = Cashbox restored  
0000110 = Cashbox door timeout  
0000111 = Cashbox opened in service, considered an alarm condition  
0001000 = Insufficient fare accepted  
0001001 = Coinbox 75% full  
0001010 = Coinbox full  
0001011 = Currency box 75% full  
0001100 = Currency box less than 75% full  
0001101 = Currency box full  
0001110 = Card/pass box 75% full  
0001111 = Card/pass box less than 75% full  
0010000 = Card/pass box full  
0010001 = Coin de-jam operated  
0010010 = Farebox set in manual bypass  
0010011 = Farebox reset to automatic mode  
0010100 = Pass/transfer jam  
0010101 = Pass/transfer jam cleared  
0010110 = Paper currency jam  
0010111 = Paper currency jam cleared  
0011000 = Maintenance access in service, considered an alarm condition  
0011001 = Maintenance access out of service  
0011010-1100000 = Reserved - to be assigned  
1100001-1111111 = Agency defined

Data Length: 7 bits  
Resolution: 128 states/7 bit, 0 offset  
Data Range: 0 to 127  
Type: Measured  
Supporting Information:  
PGN reference: 64954

Operational Range: same as data range

**SPN 3188      XBR Message Checksum**

The XBR message checksum is used to verify the signal path from the demanding device to the brake controller on electronic brake systems. The support of this parameter is mandatory if PGN 1024 is supported as there is no means to indicate "not available".

The 4 bit XBR message checksum is calculated using the first 7 data bytes, the 4 bit message counter and the bytes of the message identifier. It is calculated as follows:

Checksum = (Byte1 + Byte2 + Byte3 + Byte4 + Byte5 + Byte6 + Byte7 + message counter & 0x0F + message ID low byte + message ID mid low byte + message ID mid high byte + message ID high byte)

XBR Message Checksum = ((Checksum >> 4) + Checksum) & 0x0F

Note: A failure in the communication sets the XBR system state:

- to '01' for failed XBR 'priority 01, 10 or 11' messages
- to '10' for failed XBR 'priority 00' messages.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 4 bits                |                                       |
| Resolution:             | 1 count/bit, 0 offset |                                       |
| Data Range:             | 0 to 15               | Operational Range: same as data range |
| Type:                   | Status                |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 1024                  |                                       |

**SPN 3189      XBR Message Counter**

The XBR message counter is to verify the signal path from the demanding device to the brake controller on electronic brake systems.. The support of this parameter is mandatory.

Note: The initial value of the 4 bit message counter for the first message during a driving cycle is arbitrary. In every following message the counter is incremented by 1 (0 follows 15).

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 4 bits                |                                       |
| Resolution:             | 1 count/bit, 0 offset |                                       |
| Data Range:             | 0 to 15               | Operational Range: same as data range |
| Type:                   | Status                |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 1024                  |                                       |

**SPN 3190      *Tire Location***

Identifies which tire is associated with the parametric data in this PGN.

The low order 4 bits represent a position number, counting left to right when facing in the direction of normal vehicle travel (forward).

The high order 4 bits represent a position number, counting front to back on the vehicle.

The value 0xFF indicates not available.

It is recommended that output devices add 1 to the position number (range 1 to 15, not 0 to 14) for use by drivers and service technicians.

Examples: Tire pressure for location 0x00 would be left front tire.

Tire pressure for location 0x23 would be right outside rear rear on a 3-axle tractor with dual axle per side (3rd axle, 4th tire).

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 8 bits                     |                                       |
| Resolution:             | 256 states/8 bit, 0 offset |                                       |
| Data Range:             | 0 to 255                   | Operational Range: same as data range |
| Type:                   | Measured                   |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 64953                      |                                       |

**SPN 3191      *Reference Tire Pressure***

Reference value of the tire pressure as basis for the tire pressure monitoring

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 8 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 2,000 kPa      | Operational Range: same as data range |
| Type:                   | Status              |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64953               |                                       |

**SPN 3192      *Tire Location***

Identifies which tire is associated with the parametric data in this PGN.

The low order 4 bits represent a position number, counting left to right when facing in the direction of normal vehicle travel (forward).

The high order 4 bits represent a position number, counting front to back on the vehicle.

The value 0xFF indicates not available.

It is recommended that output devices add 1 to the position number (range 1 to 15, not 0 to 14) for use by drivers and service technicians.

Examples: Tire pressure for location 0x00 would be left front tire.

Tire pressure for location 0x23 would be right outside rear rear on a 3-axle tractor with dual axle per side (3rd axle, 4th tire).

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 8 bits                     |                                       |
| Resolution:             | 256 states/8 bit, 0 offset |                                       |
| Data Range:             | 0 to 255                   | Operational Range: same as data range |
| Type:                   | Measured                   |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 44544                      |                                       |

**SPN 3193      *Reference Tire Pressure Setting***

Reference value of the tire pressure setting as basis for the tire pressure monitoring

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 8 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 2,000 kPa      | Operational Range: same as data range |
| Type:                   | Status              |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 44544               |                                       |

**SPN 3215      Prohibit air suspension control**

This parameter is an external request to the air suspension control system to prohibit all air suspension control. If the request is accepted, response intended to be sent in ASC1 (additional status requested in ASC1), there will be no control either for height changes or axle load distribution changes, i.e. hold current pressures in all suspension devices.

00 No request  
01 Request prohibit air suspension control  
10 Error indicator  
11 Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 53760                    |                                       |

**SPN 3216      Aftertreatment 1 Intake NOx**

The amount of combined NO and NO<sub>2</sub> in the exhaust entering the aftertreatment system measured by a NO<sub>x</sub> sensor at the aftertreatment intake, represented in NO<sub>x</sub> molecule parts per million non-NO<sub>x</sub> molecules in exhaust bank 1.

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                       |                                       |
| Resolution:             | 0.05 ppm/bit, -200 ppm offset |                                       |
| Data Range:             | -200 to 3012.75 ppm           | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          | 61454                         |                                       |

**SPN 3217      Aftertreatment 1 Intake O<sub>2</sub>**

The actual oxidation factor (%O<sub>2</sub>) of the gas within the exhaust stream. For positive values, the parameter represents the percent oxygen in excess of the amount required for stoichiometric combustion. For negative values, the parameter is proportional to the amount of oxygen being pumped by the sensor. This value is measured by a sensor at the aftertreatment intake in exhaust bank 1.

A value of -12% (0x0000) indicates rich, a value of 21% (0xFAFF) indicates lean. These data points could optionally be used with switching O<sub>2</sub> sensors to indicate those states as alternatives to broadcasting the threshold %O<sub>2</sub> values. Diagnostic Tools could change display to use the text "Rich" or "Lean" in place of the implied %O<sub>2</sub> values which would also be acceptable for display.

|                         |                              |                                       |
|-------------------------|------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                      |                                       |
| Resolution:             | 0.000514 %/bit, -12 % offset |                                       |
| Data Range:             | -12% to 21%                  | Operational Range: same as data range |
| Type:                   | Measured                     |                                       |
| Supporting Information: |                              |                                       |
| PGN reference:          | 61454                        |                                       |

**SPN 3218      *Aftertreatment 1 Intake Gas Sensor Power Status***

Indicates that the power supplied to the aftertreatment intake gas sensor, either NOx or O2, is within the manufacturer's specification in exhaust bank 1.

00 - Not in range  
01 - In range  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        61454

Operational Range: same as data range

**SPN 3219      *Aftertreatment 1 Intake Gas Sensor at Temperature***

Indicates that the heater element of the aftertreatment intake gas sensor, either NOx or O2, is within the manufacturer's specified range for accurate measurements in exhaust bank 1.

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        61454

Operational Range: same as data range

**SPN 3220      *Aftertreatment 1 Intake NOx Reading Stable***

Indicates that the NOx reading of the aftertreatment intake NOx sensor is stable as determined by the manufacturer's control software in exhaust bank 1.

00 - Not stable  
01 - Stable  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        61454

Operational Range: same as data range



**SPN 3221      *Aftertreatment 1 Intake Wide-Range % O2 Reading Stable***

Indicates that the %O2 reading of the aftertreatment intake gas sensor, either NOx or O2, is stable as determined by the manufacturer's control software in exhaust bank 1.

00 - Not stable  
01 - Stable  
10 - Error  
11 - Not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 61454

Operational Range: same as data range

**SPN 3222      *Aftertreatment 1 Intake Gas Sensor Heater Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the heater of the intake exhaust gas sensor, either NOx or O2, by the manufacturer's sensor control software in exhaust bank 1. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

Data Length: 5 bits  
Resolution: Binary, 0 offset  
Data Range: 0 to 31  
Type: Status  
Supporting Information:  
PGN reference: 61454

Operational Range: same as data range

**SPN 3223      *Aftertreatment 1 Intake Gas Sensor Heater Control***

Indicates the heater status in the warm-up process. Upon receiving a power-up command, the gas sensor ramps up according to a manufacturer defined profile. The Preheat 1, Preheat 2, and Automatic messages are regions within this profile in exhaust bank 1.

00 - Automatic  
01 - Preheat 2  
10 - Preheat 1  
11 - Heater off

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 61454

Operational Range: same as data range

**SPN 3224      *Aftertreatment 1 Intake NOx Sensor Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the aftertreatment intake NOx sensor by the manufacturer's sensor control software in exhaust bank 1. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 61454            |                                       |

**SPN 3225      *Aftertreatment 1 Intake Oxygen Sensor Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the aftertreatment intake oxygen sensor by the manufacturer's sensor control software in exhaust bank 1. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 61454            |                                       |

**SPN 3226      *Aftertreatment 1 Outlet NOx***

The amount of combined NO and NO<sub>2</sub> in the exhaust exiting the aftertreatment system measured by a NOx sensor at the aftertreatment outlet, represented in NOx molecule parts per million non-NOx molecules in exhaust bank 1.

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                       |                                       |
| Resolution:             | 0.05 ppm/bit, -200 ppm offset |                                       |
| Data Range:             | -200 to 3012.75 ppm           | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          | 61455                         |                                       |

**SPN 3227      *Aftertreatment 1 Outlet O2***

The actual oxidation factor (%O2) of the gas within the exhaust stream. For positive values, the parameter represents the percent oxygen in excess of the amount required for stoichiometric combustion. For negative values, the parameter is proportional to the amount of oxygen being pumped by the sensor. This value is measured by a sensor at the aftertreatment outlet in exhaust bank 1.

A value of -12% (0x0000) indicates rich, a value of 21% (0xFAFF) indicates lean. These data points could optionally be used with switching O2 sensors to indicate those states as alternatives to broadcasting the threshold %O2 values. Diagnostic Tools could change display to use the text "Rich" or "Lean" in place of the implied %O2 values which would also be acceptable for display.

|                         |                              |                                       |
|-------------------------|------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                      |                                       |
| Resolution:             | 0.000514 %/bit, -12 % offset |                                       |
| Data Range:             | -12% to 21%                  | Operational Range: same as data range |
| Type:                   | Measured                     |                                       |
| Supporting Information: |                              |                                       |
| PGN reference:          | 61455                        |                                       |

**SPN 3228      *Aftertreatment 1 Outlet Gas Sensor Power Status***

Indicates that the power supplied to the aftertreatment outlet gas sensor, either NOx or O2, is within the manufacturer's specification in exhaust bank 1.

00 - Not in range  
01 - In range  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61455                    |                                       |

**SPN 3229      *Aftertreatment 1 Outlet Gas Sensor at Temperature***

Indicates that the heater element of the aftertreatment outlet gas sensor, either NOx or O2, is within the manufacturer's specified range for accurate measurements in exhaust bank 1.

00 - Not in range  
01 - In range  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61455                    |                                       |

**SPN 3230      *Aftertreatment 1 Outlet NOx Reading Stable***

Indicates that the NOx reading of the aftertreatment outlet NOx sensor is stable as determined by the manufacturer's control software in exhaust bank 1.

00 - Not stable  
01 - Stable  
10 - Error  
11 - Not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 61455

Operational Range: same as data range

**SPN 3231      *Aftertreatment 1 Outlet Wide-Range %O2 Reading Stable***

Indicates that the %O2 reading of the aftertreatment outlet gas sensor, either NOx or O2, is stable as determined by the manufacturer's control software in exhaust bank 1.

00 - Not stable  
01 - Stable  
10 - Error  
11 - Not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 61455

Operational Range: same as data range

**SPN 3232      *Aftertreatment 1 Outlet Gas Sensor Heater Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the heater of the outlet exhaust gas sensor, either NOx or O2, by the manufacturer's sensor control software in exhaust bank 1. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

Data Length: 5 bits  
Resolution: Binary, 0 offset  
Data Range: 0 to 31  
Type: Status  
Supporting Information:  
PGN reference: 61455

Operational Range: same as data range

**SPN 3233      *Aftertreatment 1 Outlet Gas Sensor Heater Control***

Indicates the heater status in the warm-up process. Upon receiving a power-up command, the gas sensor ramps up according to a manufacturer defined profile. The Preheat 1, Preheat 2, and Automatic messages are regions within this profile in exhaust bank 1.

00 - Automatic  
01 - Preheat 2  
10 - Preheat 1  
11 - Heater off

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 61455

Operational Range: same as data range

**SPN 3234      *Aftertreatment 1 Outlet NOx Sensor Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the aftertreatment outlet NOx sensor by the manufacturer's sensor control software in exhaust bank 1. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

Data Length: 5 bits  
Resolution: Binary, 0 offset  
Data Range: 0 to 31  
Type: Status  
Supporting Information:  
PGN reference: 61455

Operational Range: same as data range

**SPN 3235      *Aftertreatment 1 Outlet Oxygen Sensor Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the aftertreatment outlet oxygen sensor by the manufacturer's sensor control software in exhaust bank 1. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

Data Length: 5 bits  
Resolution: Binary, 0 offset  
Data Range: 0 to 31  
Type: Status  
Supporting Information:  
PGN reference: 61455

Operational Range: same as data range

**SPN 3236      *Aftertreatment 1 Exhaust Gas Mass Flow***

Measured/calculated exhaust gas mass upstream of the aftertreatment system in exhaust bank 1 and 2.

Data Length: 2 bytes  
Resolution: 0.2 kg/h per bit, 0 offset  
Data Range: 0 to 12851 kg/h per bit  
Type: Measured  
Supporting Information:  
PGN reference: 65247

Operational Range: same as data range

**SPN 3237      *Aftertreatment 1 Intake Dew Point***

Indicates that the temperature on the intake side of the aftertreatment system has exceeded the dew point, as estimated by the ECM in exhaust bank 1.

00 - Not exceeded the dew point  
01 - Exceeded the dew point  
10 - Error  
11 - Not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 65247

Operational Range: same as data range

**SPN 3238      *Aftertreatment 1 Exhaust Dew Point***

Indicates that the temperature on the exhaust side of the aftertreatment has exceeded the dew point, as estimated by the ECM in exhaust bank 1.

00 - Not exceeded the dew point  
01 - Exceeded the dew point  
10 - Error  
11 - Not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 65247

Operational Range: same as data range

**SPN 3239      *Aftertreatment 2 Intake Dew Point***

Indicates that the temperature on the intake side of the aftertreatment system has exceeded the dew point, as estimated by the ECM in exhaust bank 2.

00 - Not exceeded the dew point  
01 - Exceeded the dew point  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65247

Operational Range: same as data range

**SPN 3240      *Aftertreatment 2 Exhaust Dew Point***

Indicates that the temperature on the exhaust side of the aftertreatment has exceeded the dew point, as estimated by the ECM in exhaust bank 2.

00 - Not exceeded the dew point  
01 - Exceeded the dew point  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65247

Operational Range: same as data range

**SPN 3241      *Aftertreatment 1 Exhaust Gas Temperature 1***

The reading from the exhaust gas temperature sensor located farthest upstream in the aftertreatment system in exhaust bank 1.

Data Length:            2 bytes  
Resolution:            0.03125 deg C/bit, -273 deg C offset  
Data Range:            -273 to 1734.96875 deg C  
Type:                    Measured  
Supporting Information: See Appendix D - PGN 64948  
PGN reference:        64948

Operational Range: same as data range

**SPN 3242      *Aftertreatment 1 Diesel Particulate Filter Intake Gas Temperature***

Temperature of engine combustion byproducts entering the diesel particulate filter in exhaust bank 1.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information: See Appendix D - PGN 64948  
PGN reference: 64948

**SPN 3243      *Aftertreatment 1 Exhaust Gas Temperature 1 Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the exhaust gas temperature 1 sensor by the manufacturer's sensor control software in exhaust bank 1. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

Data Length: 5 bits  
Resolution: Binary, 0 offset  
Data Range: 0 to 31      Operational Range: same as data range  
Type: Status  
Supporting Information:  
PGN reference: 64948

**SPN 3244      *Aftertreatment 1 Diesel Particulate Filter Intake Gas Temperature Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the diesel particulate filter intake gas temperature sensor by the manufacturer's sensor control software in exhaust bank 1. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

Data Length: 5 bits  
Resolution: Binary, 0 offset  
Data Range: 0 to 31      Operational Range: same as data range  
Type: Status  
Supporting Information:  
PGN reference: 64948

**SPN 3245      *Aftertreatment 1 Exhaust Gas Temperature 3***

The reading from the exhaust gas temperature sensor located farthest downstream in the aftertreatment system in exhaust bank 1.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information: See Appendix D - PGN 64948  
PGN reference: 64947



**SPN 3246      *Aftertreatment 1 Diesel Particulate Filter Outlet Gas Temperature***

Temperature of engine combustion byproducts leaving the diesel particulate filter exhaust in exhaust bank 1.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information: See Appendix D - PGN 64948  
PGN reference: 64947

**SPN 3247      *Aftertreatment 1 Exhaust Gas Temperature 3 Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the exhaust gas temperature 3 sensor by the manufacturer's sensor control software in exhaust bank 1. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

Data Length: 5 bits  
Resolution: Binary, 0 offset  
Data Range: 0 to 31      Operational Range: same as data range  
Type: Status  
Supporting Information:  
PGN reference: 64947

**SPN 3248      *Aftertreatment 1 Diesel Particulate Filter Outlet Exhaust Gas Temperature Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the diesel particulate filter outlet gas temperature sensor by the manufacturer's sensor control software in exhaust bank 1. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

Data Length: 5 bits  
Resolution: Binary, 0 offset  
Data Range: 0 to 31      Operational Range: same as data range  
Type: Status  
Supporting Information:  
PGN reference: 64947

**SPN 3249      *Aftertreatment 1 Exhaust Gas Temperature 2***

The reading from the exhaust gas temperature sensor located midstream of the other two temperature sensors in the aftertreatment system in exhaust bank 1.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information: See Appendix D - PGN 64948  
PGN reference: 64946

**SPN 3250      *Aftertreatment 1 Diesel Particulate Filter Intermediate Gas Temperature***

Temperature of engine combustion byproducts at a mid-point in the diesel particulate filter in exhaust bank 1.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information: See Appendix D - PGN 64948  
PGN reference: 64946

**SPN 3251      *Aftertreatment 1 Diesel Particulate Filter Differential Pressure***

Exhaust differential pressure measured between the intake and exhaust of a diesel particulate filter in exhaust bank 1.

Data Length: 2 bytes  
Resolution: 0.1 kPa/bit, 0 offset  
Data Range: 0 to 6,425.5 kPa      Operational Range: same as data range  
Type: Measured  
Supporting Information: See Appendix D - PGN 64948  
PGN reference: 64946

**SPN 3252      *Aftertreatment 1 Exhaust Gas Temperature 2 Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the exhaust gas temperature 2 sensor by the manufacturer's sensor control software in exhaust bank 1. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

Data Length: 5 bits  
Resolution: Binary, 0 offset  
Data Range: 0 to 31      Operational Range: same as data range  
Type: Status  
Supporting Information:  
PGN reference: 64946

**SPN 3253      *Aftertreatment 1 Diesel Particulate Filter Delta Pressure Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the diesel particulate filter differential pressure sensor by the manufacturer's sensor control software in exhaust bank 1. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

Data Length: 5 bits  
Resolution: Binary, 0 offset  
Data Range: 0 to 31      Operational Range: same as data range  
Type: Status  
Supporting Information:  
PGN reference: 64946

**SPN 3254      *Aftertreatment 1 Diesel Particulate Filter Intermediate Gas Temperature Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the diesel particulate filter intermediate gas temperature sensor by the manufacturer's sensor control software in exhaust bank 1. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 64946            |                                       |

**SPN 3255      *Aftertreatment 2 Intake NOx***

The amount of combined NO and NO<sub>2</sub> in the exhaust entering the aftertreatment system measured by a NO<sub>x</sub> sensor at the aftertreatment intake, represented in NO<sub>x</sub> molecule parts per million non-NO<sub>x</sub> molecules in exhaust bank 2. (For a single exhaust bank system, refer to parameters in PGNs 61454, 61455, 64946, 64947, 64948, and 65247.)

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                       |                                       |
| Resolution:             | 0.05 ppm/bit, -200 ppm offset |                                       |
| Data Range:             | -200 to 3012.75 ppm           | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          | 61456                         |                                       |

**SPN 3256      *Aftertreatment 2 Intake O<sub>2</sub>***

The actual oxidation factor (%O<sub>2</sub>) of the gas within the exhaust stream. For positive values, the parameter represents the percent oxygen in excess of the amount required for stoichiometric combustion. For negative values, the parameter is proportional to the amount of oxygen being pumped by the sensor. This value is measured by a sensor at the aftertreatment intake in exhaust bank 2. (For a single exhaust bank system, refer to parameters in PGNs 61454, 61455, 64946, 64947, 64948, and 65247)

A value of -12% (0x0000) indicates rich, a value of 21% (0xFAFF) indicates lean. These data points could optionally be used with switching O<sub>2</sub> sensors to indicate those states as alternatives to broadcasting the threshold %O<sub>2</sub> values. Diagnostic Tools could change display to use the text "Rich" or "Lean" in place of the implied %O<sub>2</sub> values which would also be acceptable for display.

|                         |                              |                                       |
|-------------------------|------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                      |                                       |
| Resolution:             | 0.000514 %/bit, -12 % offset |                                       |
| Data Range:             | -12% to 21%                  | Operational Range: same as data range |
| Type:                   | Measured                     |                                       |
| Supporting Information: |                              |                                       |
| PGN reference:          | 61456                        |                                       |

**SPN 3257      *Aftertreatment 2 Intake Gas Sensor Power Status***

Indicates that the power supplied to the aftertreatment intake gas sensor, either NOx or O2, is within the manufacturer's specification in exhaust bank 2. (For a single exhaust bank system, refer to parameters in PGNs 61454, 61455, 64946, 64947, 64948, and 65247)

00 - Not in range  
01 - In range  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:           61456

Operational Range: same as data range

**SPN 3258      *Aftertreatment 2 Intake Gas Sensor at Temperature***

Indicates that the heater element of the aftertreatment intake gas sensor, either NOx or O2, is within the manufacturer's specified range for accurate measurements in exhaust bank 2. (For a single exhaust bank system, refer to parameters in PGNs 61454, 61455, 64946, 64947, 64948, and 65247)

00 - Not in range  
01 - In range  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:           61456

Operational Range: same as data range

**SPN 3259      *Aftertreatment 2 Intake NOx Reading Stable***

Indicates that the NOx reading of the aftertreatment intake NOx sensor is stable as determined by the manufacturer's control software in exhaust bank 2. (For a single exhaust bank system, refer to parameters in PGNs 61454, 61455, 64946, 64947, 64948, and 65247)

00 - Not stable  
01 - Stable  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:           61456

Operational Range: same as data range

**SPN 3260      *Aftertreatment 2 Intake Wide-Range % O2 Reading Stable***

Indicates that the %O2 reading of the aftertreatment intake gas sensor, either NOx or O2, is stable as determined by the manufacturer's control software in exhaust bank 2. (For a single exhaust bank system, refer to parameters in PGNs 61454, 61455, 64946, 64947, 64948, and 65247)

00 - Not stable  
01 - Stable  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        61456

Operational Range: same as data range

**SPN 3261      *Aftertreatment 2 Intake Gas Sensor Heater Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the heater of the intake exhaust gas sensor, either NOx or O2, by the manufacturer's sensor control software in exhaust bank 2. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated. (For a single exhaust bank system, refer to parameters in PGNs 61454, 61455, 64946, 64947, 64948, and 65247)

Data Length:            5 bits  
Resolution:            Binary, 0 offset  
Data Range:            0 to 31  
Type:                    Status  
Supporting Information:  
PGN reference:        61456

Operational Range: same as data range

**SPN 3262      *Aftertreatment 2 Intake Gas Sensor Heater Control***

Indicates the heater status in the warm-up process. Upon receiving a power-up command, the gas sensor ramps up according to a manufacturer defined profile. The Preheat 1, Preheat 2, and Automatic messages are regions within this profile in exhaust bank 2. (For a single exhaust bank system, refer to parameters in PGNs 61454, 61455, 64946, 64947, 64948, and 65247)

00 - Automatic  
01 - Preheat 2  
10 - Preheat 1  
11 - Heater off

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61456                    |                                       |

**SPN 3263      *Aftertreatment 2 Intake NOx Sensor Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the aftertreatment intake NOx sensor by the manufacturer's sensor control software in exhaust bank 2. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated. (For a single exhaust bank system, refer to parameters in PGNs 61454, 61455, 64946, 64947, 64948, and 65247)

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 61456            |                                       |

**SPN 3264      *Aftertreatment 2 Intake Oxygen Sensor Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the aftertreatment intake oxygen sensor by the manufacturer's sensor control software in exhaust bank 2. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated. (For a single exhaust bank system, refer to parameters in PGNs 61454, 61455, 64946, 64947, 64948, and 65247)

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 61456            |                                       |

**SPN 3265      *Aftertreatment 2 Outlet NOx***

The amount of combined NO and NO<sub>2</sub> in the exhaust entering the aftertreatment system measured by a NO<sub>x</sub> sensor at the aftertreatment outlet, represented in NO<sub>x</sub> molecule parts per million non-NO<sub>x</sub> molecules in exhaust bank 2. (For a single exhaust bank system, refer to parameters in PGNs 61454, 61455, 64946, 64947, 64948, and 65247)

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                       |                                       |
| Resolution:             | 0.05 ppm/bit, -200 ppm offset |                                       |
| Data Range:             | -200 to 3012.75 ppm           | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          | 61457                         |                                       |

**SPN 3266      *Aftertreatment 2 Outlet O<sub>2</sub>***

The actual oxidation factor (%O<sub>2</sub>) of the gas within the exhaust stream. For positive values, the parameter represents the percent oxygen in excess of the amount required for stoichiometric combustion. For negative values, the parameter is proportional to the amount of oxygen being pumped by the sensor. This value is measured by a sensor at the aftertreatment outlet in exhaust bank 2. (For a single exhaust bank system, refer to parameters in PGNs 61454, 61455, 64946, 64947, 64948, and 65247)

A value of -12% (0x0000) indicates rich, a value of 21% (0xFAFF) indicates lean. These data points could optionally be used with switching O<sub>2</sub> sensors to indicate those states as alternatives to broadcasting the threshold %O<sub>2</sub> values. Diagnostic Tools could change display to use the text "Rich" or "Lean" in place of the implied %O<sub>2</sub> values which would also be acceptable for display.

|                         |                              |                                       |
|-------------------------|------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                      |                                       |
| Resolution:             | 0.000514 %/bit, -12 % offset |                                       |
| Data Range:             | -12% to 21%                  | Operational Range: same as data range |
| Type:                   | Measured                     |                                       |
| Supporting Information: |                              |                                       |
| PGN reference:          | 61457                        |                                       |

**SPN 3267      *Aftertreatment 2 Outlet Gas Sensor Power Status***

Indicates that the power supplied to the aftertreatment outlet gas sensor, either NO<sub>x</sub> or O<sub>2</sub>, is within the manufacturer's specification in exhaust bank 2. (For a single exhaust bank system, refer to parameters in PGNs 61454, 61455, 64946, 64947, 64948, and 65247)

00 - Not in range  
01 - In range  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61457                    |                                       |

**SPN 3268      *Aftertreatment 2 Outlet Gas Sensor at Temperature***

Indicates that the heater element of the aftertreatment outlet gas sensor, either NO<sub>x</sub> or O<sub>2</sub>, is within the manufacturer's specified range for accurate measurements in exhaust bank 2. (For a single exhaust bank system, refer to parameters in PGNs 61454, 61455, 64946, 64947, 64948, and 65247)

00 - Not in range  
01 - In range  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        61457

Operational Range: same as data range

**SPN 3269      *Aftertreatment 2 Outlet NO<sub>x</sub> Reading Stable***

Indicates that the NO<sub>x</sub> reading of the aftertreatment outlet NO<sub>x</sub> sensor is stable as determined by the manufacturer's control software in exhaust bank 2. (For a single exhaust bank system, refer to parameters in PGNs 61454, 61455, 64946, 64947, 64948, and 65247)

00 - Not stable  
01 - Stable  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        61457

Operational Range: same as data range

**SPN 3270      *Aftertreatment 2 Outlet Wide-Range % O<sub>2</sub> Reading Stable***

Indicates that the %O<sub>2</sub> reading of the aftertreatment outlet gas sensor, either NO<sub>x</sub> or O<sub>2</sub>, is stable as determined by the manufacturer's control software in exhaust bank 2. (For a single exhaust bank system, refer to parameters in PGNs 61454, 61455, 64946, 64947, 64948, and 65247)

00 - Not stable  
01 - Stable  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        61457

Operational Range: same as data range



**SPN 3271      *Aftertreatment 2 Outlet Gas Sensor Heater Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the heater of the outlet exhaust gas sensor, either NOx or O2, by the manufacturer's sensor control software in exhaust bank 2. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated. (For a single exhaust bank system, refer to parameters in PGNs 61454, 61455, 64946, 64947, 64948, and 65247)

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 61457            |                                       |

**SPN 3272      *Aftertreatment 2 Outlet Gas Sensor Heater Control***

Indicates the heater status in the warm-up process. Upon receiving a power-up command, the gas sensor ramps up according to a manufacturer defined profile. The Preheat 1, Preheat 2, and Automatic messages are regions within this profile in exhaust bank 2. (For a single exhaust bank system, refer to parameters in PGNs 61454, 61455, 64946, 64947, 64948, and 65247)

00 - Automatic  
01 - Preheat 2  
10 - Preheat 1  
11 - Heater off

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61457                    |                                       |

**SPN 3273      *Aftertreatment 2 Outlet NOx Sensor Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the aftertreatment outlet NOx sensor by the manufacturer's sensor control software in exhaust bank 2. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated. (For a single exhaust bank system, refer to parameters in PGNs 61454, 61455, 64946, 64947, 64948, and 65247)

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 61457            |                                       |

**SPN 3274      *Aftertreatment 2 Outlet Oxygen Sensor Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the aftertreatment outlet oxygen sensor by the manufacturer's sensor control software in exhaust bank 2. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated. (For a single exhaust bank system, refer to parameters in PGNs 61454, 61455, 64946, 64947, 64948, and 65247)

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 61457            |                                       |

**SPN 3275      *Aftertreatment 2 Exhaust Gas Temperature 1***

The reading from the exhaust gas temperature sensor located farthest upstream in the aftertreatment system in exhaust bank 2. (For a single exhaust bank system, refer to parameters in PGNs 61454, 61455, 64946, 64947, 64948, and 65247)

|                         |                                      |                                       |
|-------------------------|--------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                              |                                       |
| Resolution:             | 0.03125 deg C/bit, -273 deg C offset |                                       |
| Data Range:             | -273 to 1734.96875 deg C             | Operational Range: same as data range |
| Type:                   | Measured                             |                                       |
| Supporting Information: | See Appendix D - PGN 64948           |                                       |
| PGN reference:          | 64945                                |                                       |

**SPN 3276      *Aftertreatment 2 Diesel Particulate Filter Intake Gas Temperature***

Temperature of engine combustion byproducts entering the diesel particulate filter in exhaust bank 2. (For a single exhaust bank system, refer to parameters in PGNs 61454, 61455, 64946, 64947, 64948, and 65247)

|                         |                                      |                                       |
|-------------------------|--------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                              |                                       |
| Resolution:             | 0.03125 deg C/bit, -273 deg C offset |                                       |
| Data Range:             | -273 to 1734.96875 deg C             | Operational Range: same as data range |
| Type:                   | Measured                             |                                       |
| Supporting Information: | See Appendix D - PGN 64948           |                                       |
| PGN reference:          | 64945                                |                                       |

**SPN 3277      *Aftertreatment 2 Exhaust Gas Temperature 1 Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the exhaust gas temperature 1 sensor by the manufacturer's sensor control software in exhaust bank 2. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated. (For a single exhaust bank system, refer to parameters in PGNs 61454, 61455, 64946, 64947, 64948, and 65247)

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 64945            |                                       |

**SPN 3278      *Aftertreatment 2 Diesel Particulate Filter Intake Gas Temperature Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the diesel particulate filter intake gas temperature sensor by the manufacturer's sensor control software in exhaust bank 2. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated. (For a single exhaust bank system, refer to parameters in PGNs 61454, 61455, 64946, 64947, 64948, and 65247)

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 64945            |                                       |

**SPN 3279      *Aftertreatment 2 Exhaust Gas Temperature 3***

The reading from the exhaust gas temperature sensor located farthest downstream in the aftertreatment system in exhaust bank 2. (For a single exhaust bank system, refer to parameters in PGNs 61454, 61455, 64946, 64947, 64948, and 65247)

|                         |                                      |                                       |
|-------------------------|--------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                              |                                       |
| Resolution:             | 0.03125 deg C/bit, -273 deg C offset |                                       |
| Data Range:             | -273 to 1734.96875 deg C             | Operational Range: same as data range |
| Type:                   | Measured                             |                                       |
| Supporting Information: | See Appendix D - PGN 64948           |                                       |
| PGN reference:          | 64944                                |                                       |

**SPN 3280      *Aftertreatment 2 Diesel Particulate Filter Outlet Gas Temperature***

Temperature of engine combustion byproducts leaving the diesel particulate filter exhaust in exhaust bank 2. (For a single exhaust bank system, refer to parameters in PGNs 61454, 61455, 64946, 64947, 64948, and 65247)

|                         |                                      |                                       |
|-------------------------|--------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                              |                                       |
| Resolution:             | 0.03125 deg C/bit, -273 deg C offset |                                       |
| Data Range:             | -273 to 1734.96875 deg C             | Operational Range: same as data range |
| Type:                   | Measured                             |                                       |
| Supporting Information: | See Appendix D - PGN 64948           |                                       |
| PGN reference:          | 64944                                |                                       |

**SPN 3281      *Aftertreatment 2 Exhaust Gas Temperature 3 Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the exhaust gas temperature 3 sensor by the manufacturer's sensor control software in exhaust bank 2. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated. (For a single exhaust bank system, refer to parameters in PGNs 61454, 61455, 64946, 64947, 64948, and 65247)

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 64944            |                                       |

**SPN 3282      *Aftertreatment 2 Diesel Particulate Filter Exhaust Gas Temperature Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the diesel particulate filter outlet gas temperature sensor by the manufacturer's sensor control software in exhaust bank 2. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated. (For a single exhaust bank system, refer to parameters in PGNs 61454, 61455, 64946, 64947, 64948, and 65247)

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 64944            |                                       |

**SPN 3283      *Aftertreatment 2 Exhaust Gas Temperature 2***

The reading from the exhaust gas temperature sensor located midstream of the other two temperature sensors in the aftertreatment system in exhaust bank 2. (For a single exhaust bank system, refer to parameters in PGNs 61454, 61455, 64946, 64947, 64948, and 65247)

|                         |                                      |                                       |
|-------------------------|--------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                              |                                       |
| Resolution:             | 0.03125 deg C/bit, -273 deg C offset |                                       |
| Data Range:             | -273 to 1734.96875 deg C             | Operational Range: same as data range |
| Type:                   | Measured                             |                                       |
| Supporting Information: | See Appendix D - PGN 64948           |                                       |
| PGN reference:          | 64943                                |                                       |

**SPN 3284      *Aftertreatment 2 Diesel Particulate Filter Intermediate Gas Temperature***

Temperature of engine combustion byproducts at a mid-point in the diesel particulate filter in exhaust bank 2. (For a single exhaust bank system, refer to parameters in PGNs 61454, 61455, 64946, 64947, 64948, and 65247)

|                         |                                      |                                       |
|-------------------------|--------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                              |                                       |
| Resolution:             | 0.03125 deg C/bit, -273 deg C offset |                                       |
| Data Range:             | -273 to 1734.96875 deg C             | Operational Range: same as data range |
| Type:                   | Measured                             |                                       |
| Supporting Information: | See Appendix D - PGN 64948           |                                       |
| PGN reference:          | 64943                                |                                       |

**SPN 3285      *Aftertreatment 2 Diesel Particulate Filter Differential Pressure***

Exhaust differential pressure measured between the intake and exhaust of a diesel particulate filter in exhaust bank 2. (For a single exhaust bank system, refer to parameters in PGNs 61454, 61455, 64946, 64947, 64948, and 65247)

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bytes                    |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset      |                                       |
| Data Range:             | 0 to 6,425.5 kPa           | Operational Range: same as data range |
| Type:                   | Measured                   |                                       |
| Supporting Information: | See Appendix D - PGN 64948 |                                       |
| PGN reference:          | 64943                      |                                       |

**SPN 3286      *Aftertreatment 2 Exhaust Gas Temperature 2 Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the exhaust gas temperature 2 sensor by the manufacturer's sensor control software in exhaust bank 2. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated. (For a single exhaust bank system, refer to parameters in PGNs 61454, 61455, 64946, 64947, 64948, and 65247)

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 64943            |                                       |

**SPN 3287      *Aftertreatment 2 Diesel Particulate Filter Delta Pressure Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the diesel particulate filter differential pressure sensor by the manufacturer's sensor control software in exhaust bank 2. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated. (For a single exhaust bank system, refer to parameters in PGNs 61454, 61455, 64946, 64947, 64948, and 65247)

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 64943            |                                       |

**SPN 3288      *Aftertreatment 2 Diesel Particulate Filter Intermediate Gas Temperature Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the diesel particulate filter intermediate gas temperature sensor by the manufacturer's sensor control software in exhaust bank 2. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated. (For a single exhaust bank system, refer to parameters in PGNs 61454, 61455, 64946, 64947, 64948, and 65247)

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 64943            |                                       |

**SPN 3289      *Transmission Requested Gear Feedback***

Feedback of the SPN 525 Transmission Requested Gear input as received from the shift selector, ABS or engine via PGN 256, Transmission Control 1 (TC1) or other transmission selector input. Scaling, values and parameter specific indicators are identical to those listed for SPN 525 Requested Gear.

This feedback from the transmission allows shift selectors and other TC1 input devices to verify that their Transmission Requested Gear command has been properly received by the transmission. (This parameter is not intended for driver display purposes).

In systems with mechanical or electrical shift selectors which do not support J1939 communication, this parameter allows the transmission ECU to convey the requested gear as interpreted by the transmission from its mechanical or electrical input.

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 gear value/bit, -125 offset |                                       |
| Data Range:             | -125 to 125                   | Operational Range: same as data range |
| Type:                   | Status                        |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          | 65098                         |                                       |

**SPN 3307      *Fifth Wheel Error Status***

Fifth wheel error state which conveys information when coupling status is incomplete or bad.

|      |                                          |
|------|------------------------------------------|
| 0000 | 0 - Improper Couple                      |
| 0001 | 1 - Locks Closed / No Kingpin at Startup |
| 0010 | 2 - Kingpin / Locks Open at Startup      |
| 0011 | 3 - Not Used                             |
| 0100 | 4 - Not Used                             |
| 0101 | 5 - Coupling Sequence Error              |
| 0110 | 6 - Coupling Sequence Error / Kingpin    |
| 0111 | 7 - Coupling Timing Error                |
| 1000 | 8 - Kingpin Missing More Than 5 Seconds  |
| 1001 | 9 - Kingpin / Lock Open (Handle Pulled)  |
| 1010 | 10 - Not Used                            |
| 1011 | 11 - Not Used                            |
| 1100 | 12 - Not Used                            |
| 1101 | 13 - Not Used                            |
| 1110 | 14 - Not Used                            |
| 1111 | 15 - Not available                       |

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64942                     |                                       |

**SPN 3308**      ***Fifth Wheel Vertical Force***

The amount of load being applied to the fifth wheel by the trailer. Zero load is indicated without a trailer.

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 2 bytes           |                                       |
| Resolution:             | 5 N/bit, 0 offset |                                       |
| Data Range:             | 0 to 321,275 N    | Operational Range: same as data range |
| Type:                   | Measured          |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 61458             |                                       |

**SPN 3309**      ***Fifth Wheel Drawbar Force***

Fifth wheel drawbar force, with the trailer held stationary a positive force is generated by the vehicle pulling forward.

|                         |                             |                                       |
|-------------------------|-----------------------------|---------------------------------------|
| Data Length:            | 2 bytes                     |                                       |
| Resolution:             | 10 N/bit, -320,000 N offset |                                       |
| Data Range:             | -320,000 to 322,550 N       | Operational Range: same as data range |
| Type:                   | Measured                    |                                       |
| Supporting Information: |                             |                                       |
| PGN reference:          | 61458                       |                                       |

**SPN 3310**      ***Fifth Wheel Roll Moment***

Fifth wheel roll moment force - If the moment is positive, the trailer is rolling clockwise relative to the normal vehicle forward motion.

|                         |                             |                                       |
|-------------------------|-----------------------------|---------------------------------------|
| Data Length:            | 2 bytes                     |                                       |
| Resolution:             | 10 N/bit, -320,000 N offset |                                       |
| Data Range:             | -320,000 to 322,550 N       | Operational Range: same as data range |
| Type:                   | Measured                    |                                       |
| Supporting Information: |                             |                                       |
| PGN reference:          | 61458                       |                                       |

**SPN 3311**      ***Fifth Wheel Slider Position***

Slider position measurement. Zero equals fully back position, that is, the farthest to the rear of the vehicle.

|                         |                             |                                       |
|-------------------------|-----------------------------|---------------------------------------|
| Data Length:            | 1 byte                      |                                       |
| Resolution:             | 10 mm/bit, 0 offset         |                                       |
| Data Range:             | 0 to 2500 mm (0 to 2.500 m) | Operational Range: same as data range |
| Type:                   | Measured                    |                                       |
| Supporting Information: |                             |                                       |
| PGN reference:          | 64942                       |                                       |

**SPN 3312      *Fifth Wheel Lock Ready to Couple Indicator***

Indicates to the vehicle operator that the fifth wheel lock is open and ready to couple.

- 00 Lock not open, not ready to couple
- 01 Lock open, ready to couple
- 10 Error
- 11 Not Available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 64942

Operational Range: same as data range

**SPN 3313      *Fifth Wheel Lock Couple Status Indicator***

Indicates results of coupling operation to the vehicle operator. For incomplete couples further information can be obtained from the fifth wheel error status SPN.

- 00 Incomplete or bad couple, truck should not be moved
- 01 Successful couple detected
- 10 Error
- 11 Not Available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 64942

Operational Range: same as data range

**SPN 3314      *Fifth Wheel Release Control***

Operator input used to release the fifth wheel. Fifth Wheel Release Control Security Lockout and other conditions must be properly enabled before this will function.

- 00 Coupler Locked
- 01 Coupler Unlocked, trailer can be unhitched or hitched
- 10 Error
- 11 Not Available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64980

Operational Range: same as data range



**SPN 3315**      ***Fifth Wheel Release Control Security Lockout***

Operator's fifth wheel release control interlock. This operator input must be enabled prior to activating the fifth wheel release control (SPN 3314).

00 Fifth wheel release Disabled  
01 Fifth wheel release Enabled  
10 Error  
11 Not Available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64980

Operational Range: same as data range

**SPN 3316**      ***Fifth Wheel Slider Lock Indicator***

Indicates to vehicle operator that the fifth wheel slider is in position and locked.

00 Not Locked  
01 Locked  
10 Error  
11 Not Available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64942

Operational Range: same as data range

**SPN 3317**      ***Fifth Wheel Roll Warning Indicator***

Indicates to the vehicle operator that the roll moment has exceeded a preset limit.

00 Limit not exceeded  
01 Limit exceeded  
10 error  
11 Not Available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 61458

Operational Range: same as data range

**SPN 3318**      **Pitch Angle**

The angle between the vehicle x-axis and the ground plane.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 2 bytes                   |                                       |
| Resolution:             | 0.002 deg/bit, -64 offset |                                       |
| Data Range:             | -64 to 64.51 deg          | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 61459                     |                                       |

**SPN 3319**      **Roll Angle**

The angle between the vehicle y-axis and the ground plane.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 2 bytes                   |                                       |
| Resolution:             | 0.002 deg/bit, -64 offset |                                       |
| Data Range:             | -64 to 64.51 deg          | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 61459                     |                                       |

**SPN 3322**      **Pitch Rate**

Pitch rate is the rate-of-change of the pitch angle over time, where the pitch angle vector is in the direction of travel of the vehicle.

|                         |                                           |                                       |
|-------------------------|-------------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                                   |                                       |
| Resolution:             | 0.002 deg/sec per bit, -64 deg/sec offset |                                       |
| Data Range:             | -64 to 64.51 deg/sec                      | Operational Range: same as data range |
| Type:                   | Measured                                  |                                       |
| Supporting Information: |                                           |                                       |
| PGN reference:          | 61459                                     |                                       |

**SPN 3323**      **Pitch Angle Figure of Merit**

Figure of merit for pitch angle measurement.

Bit 2 Bit 1

|   |   |                                                                        |
|---|---|------------------------------------------------------------------------|
| 0 | 0 | Pitch angle fully functional. Data is within sensor specification.     |
| 0 | 1 | Pitch angle degraded. Data is suspect due to environmental conditions. |
| 1 | 0 | Error                                                                  |
| 1 | 1 | Not available                                                          |

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61459                    |                                       |

**SPN 3324      Roll Angle Figure of Merit**

Figure of merit for roll angle measurement.

Bit 4 Bit 3

|   |   |                                                                       |
|---|---|-----------------------------------------------------------------------|
| 0 | 0 | Roll angle fully functional. Data is within sensor specification.     |
| 0 | 1 | Roll angle degraded. Data is suspect due to environmental conditions. |
| 1 | 0 | Error                                                                 |
| 1 | 1 | Not available                                                         |

Data Length: 2 bits

Resolution: 4 states/2 bit, 0 offset

Data Range: 0 to 3

Type: Status

Supporting Information:

PGN reference: 61459

Operational Range: same as data range

**SPN 3325      Pitch Rate Figure of Merit**

Figure of merit for the pitch rate measurement.

Bit 6 Bit 5

|   |   |                                                                       |
|---|---|-----------------------------------------------------------------------|
| 0 | 0 | Pitch rate fully functional. Data is within sensor specification.     |
| 0 | 1 | Pitch rate degraded. Data is suspect due to environmental conditions. |
| 1 | 0 | Error                                                                 |
| 1 | 1 | Not available                                                         |

Data Length: 2 bits

Resolution: 4 states/2 bit, 0 offset

Data Range: 0 to 3

Type: Status

Supporting Information:

PGN reference: 61459

Operational Range: same as data range

**SPN 3326      Pitch and Roll Compensated**

Compensated mode for the pitch and roll measurements. Compensation is the use of multiple sensors together to enhance the output of pitch and roll measurements.

Bit 8 Bit 7

|   |   |                  |
|---|---|------------------|
| 0 | 0 | Compensation Off |
| 0 | 1 | Compensation On  |
| 1 | 0 | Error            |
| 1 | 1 | Not Available    |

Data Length: 2 bits

Resolution: 4 states/2 bit, 0 offset

Data Range: 0 to 3

Type: Status

Supporting Information:

PGN reference: 61459

Operational Range: same as data range

**SPN 3327      Roll and Pitch Measurement Latency**

The estimated measurement latency of the measurement. NOTE: This is only the sensor latency and does not include any additional latencies that might exist because of the CAN Bus or overall system implementation. Latency is the time from sensor readings to the queuing of the message data for CAN transmission.

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 1 byte               |                                       |
| Resolution:             | 0.5 ms/bit, 0 offset |                                       |
| Data Range:             | 0 to 125 ms          | Operational Range: same as data range |
| Type:                   | Measured             |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 61459                |                                       |

**SPN 3331      Blade Rotation Angle**

The blade rotation angle measurement around the yaw (z-axis).

|                         |                                |                                       |
|-------------------------|--------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                        |                                       |
| Resolution:             | 1/128 deg/bit, -200 deg offset |                                       |
| Data Range:             | -200 to 301.99 deg             | Operational Range: same as data range |
| Type:                   | Measured                       |                                       |
| Supporting Information: |                                |                                       |
| PGN reference:          | 61460                          |                                       |

**SPN 3332      Blade Rotation Angle Figure of Merit**

Figure of merit for blade rotation measurement.

Bits

- 00 Blade Rotation Angle fully functional. Data is within sensor specification.
- 01 Blade Rotation Angle degraded. Data is suspect due to environmental conditions.
- 10 Blade Rotation Angle failed. Roll sensor failed to operate correctly.
- 11 Blade Rotation Angle not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61460                    |                                       |

**SPN 3334      Left Blade Control Mode Operator Control**

This parameter indicates the left blade control mode operator control state the user has set for the land leveling system. The operator control value directly relates to the current operator control state correlating to the left edge of the blade. The purpose of this parameter is to set the control mode (auto/manual) for the left side of the blade. For this system, the left and right side of the blade can be adjusted independently of each other to either change the elevation from a given reference point or the blade angle (also known as blade tilt)/cross slope depending on the function requested by the operator.

This parameter is intended for use in systems using two parameters (right/left) to control the blade as described above. Systems using only one parameter to control blade position, i.e. elevation, should use the Blade Control Mode Switch parameter. Only one of the following states will be active at a time. In the example below, data values are defined for

each switch type that may be used in an application. The purpose of the following switch information is to define what data should be reported based on what type of switch is used.

1. A toggle button with two states can be used, in which the button is either in the manual or the auto position at all times.

Toggle button usage is as follows:

Manual Button Pressed = 0010 Manual Operator Control Request  
 Automatic Button Pressed = 0011 Automatic Operator Control Request  
 Invalid Switch Input(ex. auto and manual read/pressed simultaneously) = 1110 Error Indicator

2. The momentary rocker switch may be used, where the default is the no button pressed position. The user can press the rocker into the manual position, and when pressure is released, it will return to the no button pressed position. The user may also press the rocker into the auto position, and when pressure is released, it will return to the no button pressed position.

Momentary rocker button usage is as follows:

No button pressed = 0000 No change  
 Manual Button Pressed = 0010 Manual Operator Control Request  
 Automatic Button Pressed = 0011 Automatic Operator Control Request  
 Invalid Switch Input(ex. auto and manual read/pressed simultaneously) = 1110 Error Indicator

3. The momentary contact button pair may be used, where the default is no buttons being pressed. The user can press the manual button, and when pressure is released, it will return to the no button pressed position. The user may press the auto button, and when pressure is released, it will return to the no button pressed position.

Momentary contact buttons (button pair) usage is as follows:

No button pressed = 0000 No change  
 Manual Button Pressed = 0010 Manual Operator Control Request  
 Automatic Button Pressed = 0011 Automatic Operator Control Request  
 Invalid Switch Input(ex. auto and manual read/pressed simultaneously) = 1110 Error Indicator

4. The momentary contact single button may be used, where the default is no button being pressed. The user can press the button, which is the button pressed position, and when pressure is released, it will return to the no button pressed position. The controller receiving this command will keep track of what mode the blade is in, auto or manual. If the blade is in manual mode to begin with, one press of the button will change to mode to auto. If the button is pressed again, the blade will be put into manual mode.

Momentary contact button (single button) usage is as follows:

No button pressed = 0000 No change  
 Mode Button Pressed = 0001 Momentary Operator Control Request

Data Values and Descriptions:

0000 No Change  
 0001 Momentary Operator Control Request  
 0010 Manual Operator Control Request  
 0011 Automatic Operator Control Request  
 1100 - 1101 Reserved  
 1110 Error Indicator  
 1111 Not Installed

Notes:

1. The operator control state can be read in two ways. One method uses the direct operator control input to determine the operator control state, while the second method relies on a secondary control to read the operator control input, then

relay the information on the data link. The parameter is designed to provide the actual operator control state to other controls that need the information.

2. Other systems with automated blade controls should be able to use this parameter, since it is an actual operator control value.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 61453                     |                                       |

**SPN 3335      *Right Blade Control Mode Operator Control***

This parameter indicates the right blade control mode operator control state the user has set for the land leveling system. The operator control value directly relates to the current operator control state correlating to the left edge of the blade. The purpose of this parameter is to set the control mode (auto/manual) for the left side of the blade. For this system, the left and right side of the blade can be adjusted independently of each other to either change the elevation from a given reference point or the blade angle (also known as blade tilt)/cross slope depending on the function requested by the operator.

This parameter is intended for use in systems using two parameters(right/left) to control the blade as described above. Systems using only one parameter to control blade position, i.e. elevation, should use the Blade Control Mode Switch parameter. Only one of the following states will be active at a time. In the example below, data values are defined for each switch type that may be used in an application. The purpose of the following switch information is to define what data should be reported based on what type of switch is used.

1. A toggle button with two states can be used, in which the button is either in the manual or the auto position at all times.

Toggle button usage is as follows:

Manual Button Pressed      = 0010    Manual Operator Control Request  
Automatic Button Pressed   = 0011    Automatic Operator Control Request  
Invalid Switch Input(ex. auto and manual read/pressed simultaneously) = 1110    Error Indicator

2. The momentary rocker switch may be used, where the default is the no button pressed position. The user can press the rocker into the manual position, and when pressure is released, it will return to the no button pressed position. The user may also press the rocker into the auto position, and when pressure is released, it will return to the no button pressed position.

Momentary rocker button usage is as follows:

No button pressed                = 0000    No change  
Manual Button Pressed        = 0010    Manual Operator Control Request  
Automatic Button Pressed   = 0011    Automatic Operator Control Request  
Invalid Switch Input(ex. auto and manual read/pressed simultaneously) = 1110    Error Indicator

3. The momentary contact button pair may be used, where the default is no buttons being pressed. The user can press the manual button, and when pressure is released, it will return to the no button pressed position. The user may press the auto button, and when pressure is released, it will return to the no button pressed position.

Momentary contact buttons (button pair) usage is as follows:

No button pressed                = 0000    No change  
Manual Button Pressed        = 0010    Manual Operator Control Request  
Automatic Button Pressed   = 0011    Automatic Operator Control Request  
Invalid Switch Input(ex. auto and manual read/pressed simultaneously) = 1110    Error Indicator

4. The momentary contact single button may be used, where the default is no button being pressed. The user can press the button, which is the button pressed position, and when pressure is released, it will return to the no button pressed position. The controller receiving this command will keep track of what mode the blade is in, auto or manual. If the blade is in manual mode to begin with, one press of the button will change to mode to auto. If the button is pressed again, the blade will be put into manual mode.

Momentary contact button (single button) usage is as follows:

No button pressed                = 0000    No change  
Mode Button Pressed            = 0001    Momentary Operator Control Request

**Data Values and Descriptions:**

0000    No Change  
0001    Momentary Operator Control Request  
0010    Manual Operator Control Request  
0011    Automatic Operator Control Request

1110 Error Indicator  
1111 Not Installed  
All other values reserved

Data Length: 4 bits  
Resolution: 16 states/4 bit, 0 offset  
Data Range: 0 to 15  
Type: Measured  
Supporting Information:  
PGN reference: 61453

Operational Range: same as data range



**SPN 3336      *Left Desired Blade Offset Operator Control***

This parameter indicates the left blade offset operator control state the user has set for the land leveling system. The left desired blade offset value is the offset measured from a given reference point to the bottom left edge of the blade. This parameter will only be used when the control mode for land leveling system has been set to auto. The purpose of this parameter is to adjust the elevation from a given reference point or the blade angle(also known as blade tilt)/cross slope depending on the function being requested by the operator for the left side of the blade.

This parameter is intended for use in systems using two parameters(left/right) to control the blade as described above. Systems using only one parameter to control blade position, i.e. elevation, should use the Desired Blade Offset Switch parameter. Only one of the following states will be active at a time.

In the example below, data values are defined for each switch type that may be used in an application. The purpose of the following switch information is to define what data should be reported based on what type of switch is used.

1. The momentary rocker switch may be used, where the default is the neutral position with no buttons pressed. The user can press the rocker into the increment button pressed position, and when pressure is released, it will return to the neutral position. The user may also press the rocker into the decrement button pressed position, and when pressure is released, it will return to the neutral position. Momentary rocker button usage is as follows:

Neutral position = 0000 No Operator Control Request  
 Increment Button Pressed = 0001 Increment Operator Control Request  
 Decrement Button Pressed = 0010 Decrement Operator Control Request  
 Invalid Switch Input(ex. inc./dec. values read simultaneously) = 1110 Error Indicator

2. The momentary contact button pair may be used, where the default is the neutral position with no buttons pressed. The user can press the increment button, and when pressure is released, it will return to the neutral position. The user may press the decrement button, and when pressure is released, it will return to the neutral position. Momentary contact button (button pair) usage is as follows:

No Button Pressed = 0000 No Operator Control Request  
 Increment Button Pressed = 0001 Increment Operator Control Request  
 Decrement Button Pressed = 0010 Decrement Operator Control Request  
 Invalid Switch Input(ex. inc./dec. values read simultaneously) = 1110 Error Indicator

**Data Values and Descriptions:**

0000 No Operator Control Request  
 0001 Increment Operator Control Request  
 0010 Decrement Operator Control Request  
 0011 - 1101 Reserved  
 1110 Error Indicator  
 1111 Not installed

**Notes:**

1. The operator control state can be read in two ways. One method uses the direct operator control input to determine the operator control state, while the second method relies on a secondary control to read the operator control input, then relay the information on the data link. The parameter is designed to provide the actual operator control state to other controls that need the information.
2. Other systems with automated blade controls should be able to use this parameter, since it is an actual operator control value.

Data Length: 4 bits  
 Resolution: 16 states/4 bit, 0 offset  
 Data Range: 0 to 15  
 Type: Measured  
 Supporting Information:  
 PGN reference: 61453

Operational Range: same as data range



**SPN 3337      *Right Desired Blade Offset Operator Control***

This parameter indicates the right blade offset operator control state the user has set for the land leveling system. The right desired blade offset value is the offset measured from a given reference point to the bottom right edge of the blade. This parameter will only be used when the control mode for land leveling system has been set to auto. The purpose of this parameter is to adjust the elevation from a given reference point or the blade angle(also known as blade tilt)/cross slope depending on the function being requested by the operator for the left side of the blade.

This parameter is intended for use in systems using two parameters(left/right) to control the blade as described above. Systems using only one parameter to control blade position, i.e. elevation, should use the Desired Blade Offset Switch parameter. Only one of the following states will be active at a time.

In the example below, data values are defined for each switch type that may be used in an application. The purpose of the following switch information is to define what data should be reported based on what type of switch is used.

1. The momentary rocker switch may be used, where the default is the neutral position with no buttons pressed. The user can press the rocker into the increment button pressed position, and when pressure is released, it will return to the neutral position. The user may also press the rocker into the decrement button pressed position, and when pressure is released, it will return to the neutral position. Momentary rocker button usage is as follows:

Neutral position = 0000 No Operator Control Request  
 Increment Button Pressed = 0001 Increment Operator Control Request  
 Decrement Button Pressed = 0010 Decrement Operator Control Request  
 Invalid Switch Input(ex. inc./dec. values read simultaneously) = 1110 Error Indicator

2. The momentary contact button pair may be used, where the default is the neutral position with no buttons pressed. The user can press the increment button, and when pressure is released, it will return to the neutral position. The user may press the decrement button, and when pressure is released, it will return to the neutral position. Momentary contact button (button pair) usage is as follows:

No Button Pressed = 0000 No Operator Control Request  
 Increment Button Pressed = 0001 Increment Operator Control Request  
 Decrement Button Pressed = 0010 Decrement Operator Control Request  
 Invalid Switch Input(ex. inc./dec. values read simultaneously) = 1110 Error Indicator

**Data Values and Descriptions:**

0000 No Operator Control Request  
 0001 Increment Operator Control Request  
 0010 Decrement Operator Control Request  
 0011 - 1101 Reserved  
 1110 Error Indicator  
 1111 Not installed

**Notes:**

1. The operator control state can be read in two ways. One method uses the direct operator control input to determine the operator control state, while the second method relies on a secondary control to read the operator control input, then relay the information on the data link. The parameter is designed to provide the actual operator control state to other controls that need the information.
2. Other systems with automated blade controls should be able to use this parameter, since it is an actual operator control value.

Data Length: 4 bits  
 Resolution: 16 states/4 bit, 0 offset  
 Data Range: 0 to 15  
 Type: Measured  
 Supporting Information:  
 PGN reference: 61453

Operational Range: same as data range

**SPN 3338      Side-shift Blade Control Mode Operator Control**

This parameter indicates the side-shift offset operator control state the user has set for the land leveling system. When an implement moves in a side-shift direction, it moves from side to side, usually along its longitudinal axis. The desired side-shift offset value is the offset measured from a given vertical reference point to the center of the blade.

Only one of the following states will be active at a time. In the example below, the data values are defined for each switch type that may be used in an application. The purpose of the following switch information is to define what data should be reported based on what type of switch is used.

1. The momentary rocker switch may be used, where the default is the neutral position with no buttons pressed. The user can press the rocker into the increment button pressed position, and when pressure is released, it will return to the neutral position. The user may also press the rocker into the decrement button pressed position, and when pressure is released, it will return to the neutral position. Momentary rocker button usage is as follows:

- Neutral position = 0000 No Operator Control Request
- Increment Button Pressed = 0001 Increment Operator Control Request
- Decrement Button Pressed = 0010 Decrement Operator Control Request

2. The momentary contact button pair may be used, where the default is the neutral position with no buttons pressed. The user can press the increment button, and when pressure is released, it will return to the neutral position. The user may press the decrement button, and when pressure is released, it will return to the neutral position. Momentary contact button (button pair) usage is as follows:

- No Button Pressed = 0000 No Operator Control Request
- Increment Button Pressed = 0001 Increment Operator Control Request
- Decrement Button Pressed = 0010 Decrement Operator Control Request

**Data Values and Descriptions:**

0000 No Operator Control Request  
0001 Increment Operator Control Request  
0010 Decrement Operator Control Request  
0011-1101 Reserved  
1110 Error Indicator  
1111 Not installed

Data Length:            4 bits  
Resolution:            16 states/4 bit, 0 offset  
Data Range:            0 to 15  
Type:                    Measured  
Supporting Information:  
PGN reference:        61453

Operational Range: same as data range

**SPN 3339*****Side-shift Desired Blade Offset Operator Control***

This parameter indicates the side-shift blade control mode operator control state the user has set for the land leveling system. When an implement moves in a side-shift direction, it moves from side to side, usually along its longitudinal axis.

The operator control value directly correlates to the current operator control state. Only one of the following states will be active at a time. In the example below, the data values are defined for each switch type that may be used in an application. The purpose of the following switch information is to define what data should be reported based on what type of switch is used.

1. A toggle button with two states can be used, in which the button is either in the manual or the auto position at all times. Toggle button usage is as follows:

Manual Position = 0010 Manual Operator Control Request  
Auto Position = 0011 Automatic Operator Control Request

2. The momentary rocker switch may be used, where the default is the no button pressed position. The user can press the rocker into the manual position, and when pressure is released, it will return to the no button pressed position. The user may also press the rocker into the auto position, and when pressure is released, it will return to the no button pressed position. Momentary rocker button usage is as follows:

No Button Pressed = 0000 No Operator Control Request  
Manual Button Pressed = 0010 Manual Operator Control Request  
Auto Button Pressed = 0011 Automatic Operator Control Request

3. The momentary contact button pair may be used, where the default is no buttons being pressed. The user can press the manual button, and when pressure is released, it will return to the no button pressed position. The user may press the auto button, and when pressure is released, it will return to the no button pressed position. Momentary contact buttons (button pair) usage is as follows:

No Button Pressed = 0000 No Operator Control Request  
Manual Button Pressed = 0010 Manual Operator Control Request  
Auto Button Pressed = 0011 Automatic Operator Control Request

4. The momentary contact single button may be used, where the default is no button being pressed. The user can press the button, which is the button pressed position, and when pressure is released, it will return to the no button pressed position. The controller receiving this command will keep track of what mode the blade is in, auto or manual. If the blade is in manual mode to begin with, one press of the button will change to mode to auto. If the button is pressed again, the blade will be put into manual mode. Momentary contact button (single button) usage is as follows:

No Button Pressed = 0000 No Operator Control Request  
Button Pressed = 0001 Momentary Operator Control Request

**Data Values and Descriptions:**

0000 No Operator Control Request  
0001 Momentary Operator Control Request  
0010 Manual Operator Control Request  
0011 Automatic Operator Control Request  
0100 - 1101 Reserved  
1110 Error Indicator  
1111 Not Installed

Data Length: 4 bits  
Resolution: 16 states/4 bit, 0 offset  
Data Range: 0 to 15  
Type: Measured  
Supporting Information:  
PGN reference: 61453

Operational Range: same as data range

**(R) SPN 3340      Engine Charge Air Cooler 1 Intake Pressure**

Pressure of air at intake to 1st or only charge air cooler, from multiple first stage turbochargers being cooled and feeding multiple second stage turbochargers.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 2 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 500 kPa        | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64938               |                                       |

**(R) SPN 3341      Engine Charge Air Cooler 2 Intake Pressure**

Pressure of air at intake to 2nd charge air cooler, from multiple first stage turbochargers being cooled and feeding multiple second stage turbochargers.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 2 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 500 kPa        | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64938               |                                       |

**SPN 3342      Engine Coolant Pump Differential Pressure**

The differential pressure measured across the input and output of the engine coolant pump.

|                         |                             |                                       |
|-------------------------|-----------------------------|---------------------------------------|
| Data Length:            | 1 byte                      |                                       |
| Resolution:             | 1.64 kPa/bit, -7 kPa offset |                                       |
| Data Range:             | -7 to 403 kPa               | Operational Range: same as data range |
| Type:                   | Measured                    |                                       |
| Supporting Information: |                             |                                       |
| PGN reference:          | 64938                       |                                       |

**SPN 3343      Engine Centrifugal Oil Filter speed**

The speed of a rotating (centrifugal) engine oil filter.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 2 bytes             |                                       |
| Resolution:             | 4 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 257,020 rpm    | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64938               |                                       |

**SPN 3344*****Support Variable Rate TSC1 Message***

This parameter indicates which TSC1 transmission rates are supported by the engine ECU in addition to the required 10ms transmission rate for temporary powertrain control purposes.

| Bit Position | Transmission Rate                        |
|--------------|------------------------------------------|
| 1            | 1000 ms transmission rate                |
| 2            | 750 ms transmission rate                 |
| 3            | 500 ms transmission rate                 |
| 4            | 250 ms transmission rate                 |
| 5            | 100 ms transmission rate                 |
| 6            | 50 ms transmission rate                  |
| 7            | 20 ms transmission rate                  |
| 8            | Reserved for SAE assignment (set to one) |

Where 0 = Transmission Rate Supported by Engine and 1 = Transmission Rate Not supported by Engine

Note: FF for this byte implies that the engine only supports standard temporary power train control (e.g. 10 ms)

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 8 bits                     |                                       |
| Resolution:             | 256 states/8 bit, 0 offset |                                       |
| Data Range:             | 0 to 255                   | Operational Range: same as data range |
| Type:                   | Status                     |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 65251                      |                                       |

**(R) SPN 3345      Support TSC1 Control Purpose Group 1**

This parameter indicates which TSC1 control purposes are supported in group 1 of 4. One bit is used to convey the support of each Control Purpose. A value of 0 equals supported and a value of 1 equals not supported. This bit logic is used to allow the default to FF to be backward compatible.

This group of 4 parameters (SPNs 3345, 3346, 3347, and 3348) indicates which TSC1 Control Purposes are supported by the engine ECU in addition to the Temporary Powertrain Control Purpose (which is denoted as control purpose P32). All ones in the Group 1 through 4 parameters indicates the engine only supports Temporary Powertrain Control.

## Group 1 of 4

| Bit Position | Control Purpose Value | Control Purpose Description          |
|--------------|-----------------------|--------------------------------------|
| 1            | P1                    | Accelerator Pedal/Operator Selection |
| 2            | P2                    | Cruise Control                       |
| 3            | P3                    | PTO Governor                         |
| 4            | P4                    | Road Speed Governor                  |
| 5            | P5                    | Engine protection                    |
| 6            | P6                    | Reserved for assignment by SAE       |
| 7            | P7                    | Reserved for assignment by SAE       |
| 8            | P8                    | Reserved for assignment by SAE       |

Where 0 = Control Purpose is supported and 1 = Control Purpose is not supported

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 8 bits                     |                                       |
| Resolution:             | 256 states/8 bit, 0 offset |                                       |
| Data Range:             | 0 to 255                   | Operational Range: same as data range |
| Type:                   | Status                     |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 65251                      |                                       |



**SPN 3346      Support TSC1 Control Purpose Group 2**

This parameter indicates which TSC1 control purposes are supported in group 2 of 4. One bit is used to convey the support of each Control Purpose. A value of 0 equals supported and a value of 1 equals not supported. This bit logic is used to allow the default to FF to be backward compatible.

This group of 4 parameters (SPNs 3345, 3346, 3347, and 3348) indicates which TSC1 Control Purposes are supported by the engine ECU in addition to the Temporary Powertrain Control Purpose (which is denoted as control purpose P32). All ones in the Group 1 through 4 parameters indicates the engine only supports Temporary Powertrain Control.

## Group 2 of 4

| Bit Position | Control Purpose Value | Control Purpose Description    |
|--------------|-----------------------|--------------------------------|
| 1            | P9                    | Reserved for assignment by SAE |
| 2            | P10                   | Reserved for assignment by SAE |
| 3            | P11                   | Reserved for assignment by SAE |
| 4            | P12                   | Reserved for assignment by SAE |
| 5            | P13                   | Reserved for assignment by SAE |
| 6            | P14                   | Reserved for assignment by SAE |
| 7            | P15                   | Reserved for assignment by SAE |
| 8            | P16                   | Reserved for assignment by SAE |

Where 0 = Control Purpose is supported and 1 = Control Purpose is not supported

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 8 bits                     |                                       |
| Resolution:             | 256 states/8 bit, 0 offset |                                       |
| Data Range:             | 0 to 255                   | Operational Range: same as data range |
| Type:                   | Status                     |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 65251                      |                                       |

**SPN 3347****Support TSC1 Control Purpose Group 3**

This parameter indicates which TSC1 control purposes are supported in group 3 of 4. One bit is used to convey the support of each Control Purpose. A value of 0 equals supported and a value of 1 equals not supported. This bit logic is used to allow the default to FF to be backward compatible.

This group of 4 parameters (SPNs 3345, 3346, 3347, and 3348) indicates which TSC1 Control Purposes are supported by the engine ECU in addition to the Temporary Powertrain Control Purpose (which is denoted as control purpose P32). All ones in the Group 1 through 4 parameters indicates the engine only supports Temporary Powertrain Control.

## Group 3 of 4

| Bit Position | Control Purpose Value | Control Purpose Description    |
|--------------|-----------------------|--------------------------------|
| 1            | P17                   | Reserved for assignment by SAE |
| 2            | P18                   | Reserved for assignment by SAE |
| 3            | P19                   | Reserved for assignment by SAE |
| 4            | P20                   | Reserved for assignment by SAE |
| 5            | P21                   | Reserved for assignment by SAE |
| 6            | P22                   | Reserved for assignment by SAE |
| 7            | P23                   | Reserved for assignment by SAE |
| 8            | P24                   | Reserved for assignment by SAE |

Where 0 = Control Purpose is supported and 1 = Control Purpose is not supported

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 8 bits                     |                                       |
| Resolution:             | 256 states/8 bit, 0 offset |                                       |
| Data Range:             | 0 to 255                   | Operational Range: same as data range |
| Type:                   | Status                     |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 65251                      |                                       |

**SPN 3348****Support TSC1 Control Purpose Group 4**

This parameter indicates which TSC1 control purposes are supported in group 4 of 4. One bit is used to convey the support of each Control Purpose. A value of 0 equals supported and a value of 1 equals not supported. This bit logic is used to allow the default to FF to be backward compatible.

This group of 4 parameters (SPNs 3345, 3346, 3347, and 3348) indicates which TSC1 Control Purposes are supported by the engine ECU in addition to the Temporary Powertrain Control Purpose (which is denoted as control purpose P32). All ones in the Group 1 through 4 parameters indicates the engine only supports Temporary Powertrain Control.

## Group 4 of 4

| Bit Position | Control Purpose Value | Control Purpose Description              |
|--------------|-----------------------|------------------------------------------|
| 1            | P25                   | Reserved for assignment by SAE           |
| 2            | P26                   | Reserved for assignment by SAE           |
| 3            | P27                   | Reserved for assignment by SAE           |
| 4            | P28                   | Reserved for assignment by SAE           |
| 5            | P29                   | Reserved for assignment by SAE           |
| 6            | P30                   | Reserved for assignment by SAE           |
| 7            | P31                   | Reserved for assignment by SAE           |
| 8            | See Note              | Not assignable, must always be set to 1. |

Where 0 = Control Purpose is supported and 1 = Control Purpose is not supported

NOTE: P32 is always supported and is Temporary Power Train Control (the original use of the TSC1 Command). The engine configuration will not indicate separate support of Temporary Power Train Control mode.

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 8 bits                     |                                       |
| Resolution:             | 256 states/8 bit, 0 offset |                                       |
| Data Range:             | 0 to 255                   | Operational Range: same as data range |
| Type:                   | Status                     |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 65251                      |                                       |

**SPN 3349      TSC1 Transmission Rate**

This parameter indicates the transmission rate at which the sending device will transmit the TSC1 message. The engine shall adjust its timeout for TSC1 messages accordingly. Variable TSC1 transmission rates shall only apply to messages sent to the engine.

A value of all ones is to be used in TSC1 messages directed to retarders because the TSC1 Transmission Rate parameter is not applicable for retarders. All TSC1 messages sent to the retarder shall use the standard 50 ms rate.

Devices sending TSC1 messages to the engine should only invoke alternative transmission rates which the engine has indicated it supports in SPN 3344 – Support Variable Rate TSC1 Message.

000 = 1000 ms transmission rate  
001 = 750 ms transmission rate  
010 = 500 ms transmission rate  
011 = 250 ms transmission rate  
100 = 100 ms transmission rate  
101 = 50 ms transmission rate  
110 = 20 ms transmission rate  
111 = Use standard TSC1 transmission rates of 10 ms to engine

Note: Sending devices shall not send variable rate TSC1 messages to the engine for unsupported control purposes.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 3 bits                   |                                       |
| Resolution:             | 8 states/3 bit, 0 offset |                                       |
| Data Range:             | 0 to 7                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 0                        |                                       |

**SPN 3350      TSC1 Control Purpose**

State signal which indicates which control mode the sending device is using to generate the TSC1 command. Note that the modes are not in prioritized order. Not all modes may be relevant for a given device. Some devices may not implement all functions. For typical priorities refer to Figures SPN512\_A, SPN512\_B for engine control and Figure SPN695\_A. The TSC1 control purpose shall only apply to messages sent to the engine.

A value of all ones is to be used in TSC1 messages directed to retarders because the TSC1 Control Purpose parameter is not applicable for retarders.

00000 = P1 = Accelerator Pedal/Operator Selection  
00001 = P2 = Cruise Control  
00010 = P3 = PTO Governor  
00011 = P4 = Road Speed Governor  
00100 = P5 = Engine Protection  
00101 - 11110 = P6-P31 = Reserved for SAE Assignment  
11111 = P32 = Temporary Power Train Control (Original use of TSC1 Command)

Note: Sending devices shall not send variable rate TSC1 messages to the engine for unsupported control purposes.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 5 bits                    |                                       |
| Resolution:             | 32 states/5 bit, 0 offset |                                       |
| Data Range:             | 0 to 31                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 0                         |                                       |

**SPN 3353      Alternator 1 Status**

Alternator 1 operating status.

00 Alternator 1 not charging  
01 Alternator 1 charging  
10 error  
11 not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65237

Operational Range: same as data range

**SPN 3354      Alternator 2 Status**

Alternator 2 operating status.

00 Alternator 2 not charging  
01 Alternator 2 charging  
10 error  
11 not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65237

Operational Range: same as data range

**SPN 3355      Alternator 3 Status**

Alternator 3 operating status.

00 Alternator 3 not charging  
01 Alternator 3 charging  
10 error  
11 not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65237

Operational Range: same as data range

**SPN 3356      Alternator 4 Status**

Alternator 4 operating status.

00 Alternator 4 not charging

01 Alternator 4 charging

10 error

11 not available

Data Length:            2 bits

Resolution:            4 states/2 bit, 0 offset

Data Range:            0 to 3

Operational Range: same as data range

Type:                    Measured

Supporting Information:

PGN reference:        65237

**SPN 3357      Actual Maximum Available Engine - Percent Torque**

This is the maximum amount of torque that the engine can immediately deliver as a percentage of the reference engine torque (SPN 544). The Actual Maximum Available Engine - Percent Torque shall take into consideration all engine torque derates (e.g. air fuel ratio control (AFC), noise control, etc.) that could potentially be active in the system. This parameter differentiates itself from the engine percent torque points 1 through 5 of the engine configuration map because it takes into account all dynamic internal inputs such as AFC and that it is updated on a 50ms basis.

Data Length:            1 byte

Resolution:            0.4 %/bit, 0 offset

Data Range:            0 to 100 %

Operational Range: same as data range

Type:                    Measured

Supporting Information:

PGN reference:        61443

**(R) SPN 3358      Engine Exhaust Gas Recirculation 1 Intake Pressure**

EGR intake gage pressure is measured after the EGR cooler and before the EGR valve.

Data Length:            1 byte

Resolution:            2 kPa/bit, 0 offset

Data Range:            0 to 500 kPa

Operational Range: same as data range

Type:                    Measured

Supporting Information:

PGN reference:        64961

**SPN 3359      *Transmission Oil Filter Restriction Switch***

This switch indicates whether the transmission oil filter is clogged.

00 - No restriction  
01 - Restriction exists on oil filter  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64917                    |                                       |

**(R) SPN 3363      *Aftertreatment 1 SCR Catalyst Tank Heater***

Percentage of heating applied to the aftertreatment 1 catalyst tank heater. A value of 0% means no heating applied, a value of 100% means full heating applied. The catalyst tank heater warms the catalyst reagent in the catalyst tank. See SPN 5137 for the command for this tank heater.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 1 byte                    |                                       |
| Resolution:             | 0.4 %/bit, 0 offset       |                                       |
| Data Range:             | 0 to 100 %                | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: | See Appendix D - SPN 1761 |                                       |
| PGN reference:          | 65110                     |                                       |

**SPN 3365      *Relative Blade Height***

The measured vertical distance from a fixed location on the machine blade to a ground-based reference (i.e. relative height). Examples of a ground based reference include a curb, a stringline or the ground itself. The measurement may be positive or negative based on the initial reference used.

|                         |                              |                                       |
|-------------------------|------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                      |                                       |
| Resolution:             | 0.1 mm/bit, -3,200 mm offset |                                       |
| Data Range:             | -3,200 to 3,225.5 mm         | Operational Range: same as data range |
| Type:                   | Measured                     |                                       |
| Supporting Information: |                              |                                       |
| PGN reference:          | 61460                        |                                       |

**SPN 3366      *Relative Blade Height and Blade Rotation Angle Measurement Latency***

The estimated measurement latency of the measurement.

NOTE: This is only the sensor latency and does not include any additional latencies that might exist because of the CAN Bus or overall system implementation.

For example, if the technique used is a sonic pulse/echo system, the round trip time divided by two will be a reasonably accurate estimate of the measurement latency if the processing time is small with respect to the propagation time.

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 1 byte               |                                       |
| Resolution:             | 0.5 ms/bit, 0 offset |                                       |
| Data Range:             | 0 to 125 ms          | Operational Range: same as data range |
| Type:                   | Measured             |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 61460                |                                       |

**SPN 3367      *Relative Blade Height Figure of Merit***

Figure of merit for blade height measurement.

Bits

00 Relative Blade Height fully functional. Data is within sensor specification.  
01 Relative Blade Height degraded. Data is suspect due to environmental conditions.  
10 Relative Blade Height failed.  
11 Relative Blade Height not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61460                    |                                       |

**SPN 3368      *Network Transceiver Status 1***

Indicates the status of the transceiver for the wireless communications network type

0 = Off  
1 = On  
2 = Not Authorized to Operate on Network  
3-250 = Reserved for Future Assignment  
251-253 = Reserved  
254 = Error  
255 = Not Available

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 8 bits                     |                                       |
| Resolution:             | 256 states/8 bit, 0 offset |                                       |
| Data Range:             | 0 to 255                   | Operational Range: same as data range |
| Type:                   | Status                     |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 64937                      |                                       |



**SPN 3369      Network Service Status 1**

Indicates the status of the Service for the wireless communications network type

0 = Local Service  
1 = Roaming Service  
2 = Service not available  
3 = Not Authorized to Operate on Service  
4-250 = Reserved for Future Assignment  
251-253 = Reserved  
254 = Error  
255 = Not Available

Data Length:            8 bits  
Resolution:            256 states/8 bit, 0 offset  
Data Range:            0 to 255  
Type:                    Status  
Supporting Information:  
PGN reference:        64937

Operational Range: same as data range

**SPN 3370      Network Antenna Status 1**

Indicates the status of the antenna for the wireless communications network type

0 = Off  
1 = On  
2-250 = Reserved for Future Assignment  
251-253 = Reserved  
254 = Error  
255 = Not Available

Data Length:            8 bits  
Resolution:            256 states/8 bit, 0 offset  
Data Range:            0 to 255  
Type:                    Status  
Supporting Information:  
PGN reference:        64937

Operational Range: same as data range

**SPN 3371      Network Signal Strength 1**

Indicates the signal strength for the wireless communications network type.

Data Length:            1 byte  
Resolution:            0.4 %/bit, 0 offset  
Data Range:            0 to 100 %  
Type:                    Status  
Supporting Information:  
PGN reference:        64937

Operational Range: same as data range

**SPN 3372      *Wireless Communication Network Type 1***

Type of Wireless Communication Network

0 = Cellular network #1  
1 = Cellular network #2  
2 = Wireless LAN #1  
3 = Wireless LAN #2  
4 = Satellite network  
5-250 = Reserved for Future Assignment  
251-253 = Reserved  
254 = Error  
255 = Not Available

Data Length:            8 bits  
Resolution:            256 states/8 bit, 0 offset  
Data Range:            0 to 255  
Type:                    Status  
Supporting Information:  
PGN reference:        64937

Operational Range: same as data range

**SPN 3387      *Engine Cylinder 1 Combustion Status***

This parameter is used to indicate state of combustion in engine cylinder #1

00    No combustion  
01    Combustion exists  
10    Error  
11    Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        61462

Operational Range: same as data range

**SPN 3388      *Engine Cylinder 2 Combustion Status***

This parameter is used to indicate state of combustion in engine cylinder #2

00    No combustion  
01    Combustion exists  
10    Error  
11    Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        61462

Operational Range: same as data range

**SPN 3389      Engine Cylinder 3 Combustion Status**

This parameter is used to indicate state of combustion in engine cylinder #3

00      No combustion  
01      Combustion exists  
10      Error  
11      Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3                            Operational Range: same as data range  
Type:                    Status  
Supporting Information:  
PGN reference:        61462

**SPN 3390      Engine Cylinder 4 Combustion Status**

This parameter is used to indicate state of combustion in engine cylinder #4

00      No combustion  
01      Combustion exists  
10      Error  
11      Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3                            Operational Range: same as data range  
Type:                    Status  
Supporting Information:  
PGN reference:        61462

**SPN 3391      Engine Cylinder 5 Combustion Status**

This parameter is used to indicate state of combustion in engine cylinder #5

00      No combustion  
01      Combustion exists  
10      Error  
11      Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3                            Operational Range: same as data range  
Type:                    Status  
Supporting Information:  
PGN reference:        61462

**SPN 3392      Engine Cylinder 6 Combustion Status**

This parameter is used to indicate state of combustion in engine cylinder #6

00    No combustion  
01    Combustion exists  
10    Error  
11    Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        61462

Operational Range: same as data range

**SPN 3393      Engine Cylinder 7 Combustion Status**

This parameter is used to indicate state of combustion in engine cylinder #7

00    No combustion  
01    Combustion exists  
10    Error  
11    Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        61462

Operational Range: same as data range

**SPN 3394      Engine Cylinder 8 Combustion Status**

This parameter is used to indicate state of combustion in engine cylinder #8

00    No combustion  
01    Combustion exists  
10    Error  
11    Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        61462

Operational Range: same as data range

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**SPN 3395      Engine Cylinder 9 Combustion Status**

This parameter is used to indicate state of combustion in engine cylinder #9

00      No combustion  
01      Combustion exists  
10      Error  
11      Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3                            Operational Range: same as data range  
Type:                    Status  
Supporting Information:  
PGN reference:        61462

**SPN 3396      Engine Cylinder 10 Combustion Status**

This parameter is used to indicate state of combustion in engine cylinder #10

00      No combustion  
01      Combustion exists  
10      Error  
11      Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3                            Operational Range: same as data range  
Type:                    Status  
Supporting Information:  
PGN reference:        61462

**SPN 3397      Engine Cylinder 11 Combustion Status**

This parameter is used to indicate state of combustion in engine cylinder #11

00      No combustion  
01      Combustion exists  
10      Error  
11      Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3                            Operational Range: same as data range  
Type:                    Status  
Supporting Information:  
PGN reference:        61462

**SPN 3398      Engine Cylinder 12 Combustion Status**

This parameter is used to indicate state of combustion in engine cylinder #12

00      No combustion  
01      Combustion exists  
10      Error  
11      Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3                            Operational Range: same as data range  
Type:                    Status  
Supporting Information:  
PGN reference:        61462

**SPN 3399      Engine Cylinder 13 Combustion Status**

This parameter is used to indicate state of combustion in engine cylinder #13

00      No combustion  
01      Combustion exists  
10      Error  
11      Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3                            Operational Range: same as data range  
Type:                    Status  
Supporting Information:  
PGN reference:        61462

**SPN 3400      Engine Cylinder 14 Combustion Status**

This parameter is used to indicate state of combustion in engine cylinder #14

00      No combustion  
01      Combustion exists  
10      Error  
11      Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3                            Operational Range: same as data range  
Type:                    Status  
Supporting Information:  
PGN reference:        61462

**SPN 3401      Engine Cylinder 15 Combustion Status**

This parameter is used to indicate state of combustion in engine cylinder #15

00      No combustion  
01      Combustion exists  
10      Error  
11      Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        61462

Operational Range: same as data range

**SPN 3402      Engine Cylinder 16 Combustion Status**

This parameter is used to indicate state of combustion in engine cylinder #16

00      No combustion  
01      Combustion exists  
10      Error  
11      Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        61462

Operational Range: same as data range

**SPN 3403      Engine Cylinder 17 Combustion Status**

This parameter is used to indicate state of combustion in engine cylinder #17

00      No combustion  
01      Combustion exists  
10      Error  
11      Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        61462

Operational Range: same as data range

**SPN 3404      Engine Cylinder 18 Combustion Status**

This parameter is used to indicate state of combustion in engine cylinder #18

00      No combustion  
01      Combustion exists  
10      Error  
11      Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3                            Operational Range: same as data range  
Type:                    Status  
Supporting Information:  
PGN reference:        61462

**SPN 3405      Engine Cylinder 19 Combustion Status**

This parameter is used to indicate state of combustion in engine cylinder #19

00      No combustion  
01      Combustion exists  
10      Error  
11      Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3                            Operational Range: same as data range  
Type:                    Status  
Supporting Information:  
PGN reference:        61462

**SPN 3406      Engine Cylinder 20 Combustion Status**

This parameter is used to indicate state of combustion in engine cylinder #20

00      No combustion  
01      Combustion exists  
10      Error  
11      Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3                            Operational Range: same as data range  
Type:                    Status  
Supporting Information:  
PGN reference:        61462

\*\*\*\*\*



**SPN 3407      Engine Cylinder 21 Combustion Status**

This parameter is used to indicate state of combustion in engine cylinder #21

00      No combustion  
01      Combustion exists  
10      Error  
11      Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        61462

Operational Range: same as data range

**SPN 3408      Engine Cylinder 22 Combustion Status**

This parameter is used to indicate state of combustion in engine cylinder #22

00      No combustion  
01      Combustion exists  
10      Error  
11      Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        61462

Operational Range: same as data range

**SPN 3409      Engine Cylinder 23 Combustion Status**

This parameter is used to indicate state of combustion in engine cylinder #23

00      No combustion  
01      Combustion exists  
10      Error  
11      Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        61462

Operational Range: same as data range

**SPN 3410      Engine Cylinder 24 Combustion Status**

This parameter is used to indicate state of combustion in engine cylinder #24

00    No combustion  
01    Combustion exists  
10    Error  
11    Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        61462

Operational Range: same as data range

**SPN 3411      Status 2 of doors**

Composite indication of all bus door statuses. Enabled means the bus doors are able to be automatically opened or closed.

00   all bus doors are disabled  
01   at least 1 bus door enabled  
10   error  
11   not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65102

Operational Range: same as data range

**SPN 3412      Lock Status of Door 1**

Lock status of bus door 1

00   unlocked  
01   locked  
10   error  
11   not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64933

Operational Range: same as data range

**SPN 3413      *Open Status of Door 1***

Open status of bus door 1

00 door closed  
01 door opened  
10 error  
11 not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64933

Operational Range: same as data range

**SPN 3414      *Enable Status of Door 1***

Enable status of bus door 1. Enabled means the bus doors are able to be automatically opened or closed.

00 door disabled  
01 door enabled  
10 error  
11 not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64933

Operational Range: same as data range

**SPN 3415      *Lock Status of Door 2***

Lock status of bus door 2

00 unlocked  
01 locked  
10 error  
11 not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64933

Operational Range: same as data range

**SPN 3416      *Open Status of Door 2***

Open status of bus door 2

00 door closed  
01 door opened  
10 error  
11 not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64933

Operational Range: same as data range

**SPN 3417      *Enable Status of Door 2***

Enable status of bus door 2. Enabled means the bus doors are able to be automatically opened or closed.

00 door disabled  
01 door enabled  
10 error  
11 not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64933

Operational Range: same as data range

**SPN 3418      *Lock Status of Door 3***

Lock status of bus door 3

00 unlocked  
01 locked  
10 error  
11 not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64933

Operational Range: same as data range

**SPN 3419      *Open Status of Door 3***

Open status of bus door 3

00 door closed  
01 door opened  
10 error  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64933

Operational Range: same as data range

**SPN 3420      *Enable Status of Door 3***

Enable status of bus door 3. Enabled means the bus doors are able to be automatically opened or closed.

00 door disabled  
01 door enabled  
10 error  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64933

Operational Range: same as data range

**SPN 3421      *Lock Status of Door 4***

Lock status of bus door 4

00 unlocked  
01 locked  
10 error  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64933

Operational Range: same as data range

**SPN 3422      *Open Status of Door 4***

Open status of bus door 4

00 door closed  
01 door opened  
10 error  
11 not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64933

Operational Range: same as data range

**SPN 3423      *Enable Status of Door 4***

Enable status of bus door 4. Enabled means the bus doors are able to be automatically opened or closed.

00 door disabled  
01 door enabled  
10 error  
11 not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64933

Operational Range: same as data range

**SPN 3424      *Lock Status of Door 5***

Lock status of bus door 5

00 unlocked  
01 locked  
10 error  
11 not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64933

Operational Range: same as data range

**SPN 3425      *Open Status of Door 5***

Open status of bus door 5

00 door closed  
01 door opened  
10 error  
11 not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64933

Operational Range: same as data range

**SPN 3426      *Enable Status of Door 5***

Enable status of bus door 5. Enabled means the bus doors are able to be automatically opened or closed.

00 door disabled  
01 door enabled  
10 error  
11 not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64933

Operational Range: same as data range

**SPN 3427      *Lock Status of Door 6***

Lock status of bus door 6

00 unlocked  
01 locked  
10 error  
11 not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64933

Operational Range: same as data range

**SPN 3428      *Open Status of Door 6***

Open status of bus door 6

00 door closed  
01 door opened  
10 error  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64933

Operational Range: same as data range

**SPN 3429      *Enable Status of Door 6***

Enable status of bus door 6. Enabled means the bus doors are able to be automatically opened or closed.

00 door disabled  
01 door enabled  
10 error  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64933

Operational Range: same as data range

**SPN 3430      *Lock Status of Door 7***

Lock status of bus door 7

00 unlocked  
01 locked  
10 error  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64933

Operational Range: same as data range



**SPN 3431      *Open Status of Door 7***

Open status of bus door 7

00 door closed  
01 door opened  
10 error  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64933

Operational Range: same as data range

**SPN 3432      *Enable Status of Door 7***

Enable status of bus door 7. Enabled means the bus doors are able to be automatically opened or closed.

00 door disabled  
01 door enabled  
10 error  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64933

Operational Range: same as data range

**SPN 3433      *Lock Status of Door 8***

Lock status of bus door 8

00 unlocked  
01 locked  
10 error  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64933

Operational Range: same as data range

**SPN 3434      *Open Status of Door 8***

Open status of bus door 8

00 door closed  
01 door opened  
10 error  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64933

Operational Range: same as data range

**SPN 3435      *Enable Status of Door 8***

Enable status of bus door 8. Enabled means the bus doors are able to be automatically opened or closed.

00 door disabled  
01 door enabled  
10 error  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64933

Operational Range: same as data range

**SPN 3436      *Lock Status of Door 9***

Lock status of bus door 9

00 unlocked  
01 locked  
10 error  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64933

Operational Range: same as data range

**SPN 3437      Open Status of Door 9**

Open status of bus door 9

00 door closed  
01 door opened  
10 error  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64933

Operational Range: same as data range

**SPN 3438      Enable Status of Door 9**

Enable status of bus door 9. Enabled means the bus doors are able to be automatically opened or closed.

00 door disabled  
01 door enabled  
10 error  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64933

Operational Range: same as data range

**SPN 3439      Lock Status of Door 10**

Lock status of bus door 10

00 unlocked  
01 locked  
10 error  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64933

Operational Range: same as data range

**SPN 3440      *Open Status of Door 10***

Open status of bus door 10

00 door closed  
01 door opened  
10 error  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64933

Operational Range: same as data range

**SPN 3441      *Enable Status of Door 10***

Enable status of bus door 10. Enabled means the bus doors are able to be automatically opened or closed.

00 door disabled  
01 door enabled  
10 error  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64933

Operational Range: same as data range

**SPN 3442      *Network Transceiver Status 2***

Indicates the status of the transceiver for the wireless communications network type

0 = Off  
1 = On  
2 = Not Authorized to Operate on Network  
3-250 = Reserved for Future Assignment  
251-253 = Reserved  
254 = Error  
255 = Not Available

Data Length: 8 bits  
Resolution: 256 states/8 bit, 0 offset  
Data Range: 0 to 255  
Type: Status  
Supporting Information:  
PGN reference: 64936

Operational Range: same as data range

**SPN 3443      Network Service Status 2**

Indicates the status of the Service for the wireless communications network type

0 = Local Service  
1 = Roaming Service  
2 = Service not available  
3 = Not Authorized to Operate on Service  
4-250 = Reserved for Future Assignment  
251-253 = Reserved  
254 = Error  
255 = Not Available

Data Length:            8 bits  
Resolution:            256 states/8 bit, 0 offset  
Data Range:            0 to 255  
Type:                    Status  
Supporting Information:  
PGN reference:        64936

Operational Range: same as data range

**SPN 3444      Network Antenna Status 2**

Indicates the status of the antenna for the wireless communications network type

0 = Off  
1 = On  
2-250 = Reserved for Future Assignment  
251-253 = Reserved  
254 = Error  
255 = Not Available

Data Length:            8 bits  
Resolution:            256 states/8 bit, 0 offset  
Data Range:            0 to 255  
Type:                    Status  
Supporting Information:  
PGN reference:        64936

Operational Range: same as data range

**SPN 3445      Network Signal Strength 2**

Indicates the signal strength for the wireless communications network type.

Data Length:            1 byte  
Resolution:            0.4 %/bit, 0 offset  
Data Range:            0 to 100 %  
Type:                    Status  
Supporting Information:  
PGN reference:        64936

Operational Range: same as data range

**SPN 3446      Wireless Communication Network Type 2**

Type of Wireless Communication Network

0 = Cellular network #1  
1 = Cellular network #2  
2 = Wireless LAN #1  
3 = Wireless LAN #2  
4 = Satellite network  
5-250 = Reserved for Future Assignment  
251-253 = Reserved  
254 = Error  
255 = Not Available

Data Length:            8 bits  
Resolution:            256 states/8 bit, 0 offset  
Data Range:            0 to 255  
Type:                    Status  
Supporting Information:  
PGN reference:        64936

Operational Range: same as data range

**SPN 3447      Remote PTO Governor Preprogrammed Speed Control Switch #2**

Switch signal which indicates that the remote PTO governor toggle switch #2 is in the enabled (ON) position. If the toggle switch is enabled and other conditions are satisfied then the remote PTO governor control feature is activated and the PTO governor will control at the preprogrammed speed #2.

00 - Off  
01 - On  
10 - Error  
11 - Not Available

Note: This switch is different than the 1-8 Preprogrammed Set Speeds because this is a physical switch input, not a user programmable set speed (although the associated PTO set speed for this toggle switch is user defined).

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        65264

Operational Range: same as data range

**SPN 3448      *Auxiliary Input Ignore Switch***

Switch signal which overrides other switch input's ability to disable an engine's operating condition.

00 - Off  
01 - On  
10 - Error  
11 - Not Available

This switch input can be used to prevent the PTO from disengaging if another switch input's state changes. For example, if the PTO is normally disengaged when the clutch is depressed, then this switch would allow the user to use PTO while depressing the clutch.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65264                    |                                       |

**SPN 3452      *Enable Switch – Transmission input shaft PTO 1***

Status of the operator's switch or other input which indicates the desire for engaging the first PTO drive mounted on the transmission case. There may be more than one PTO drive mounted on the transmission case.

00 Enable switch off – PTO operation not desired  
01 Enable switch off – PTO operation desired  
10 Error  
11 Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64932                    |                                       |

**SPN 3453      *Enable Switch – Transmission input shaft PTO 2***

Status of the operator's switch or other input which indicates the desire for engaging the second PTO drive mounted on the transmission case. If there is only one PTO drive on the transmission case, use SPN 3452 Enable Switch – Transmission input shaft PTO 1.

00 Enable switch off – PTO operation not desired  
01 Enable switch off – PTO operation desired  
10 Error  
11 Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64932                    |                                       |

**SPN 3454      *Enable Switch – Transmission output shaft PTO***

Status of the operator's switch or other input which indicates the desire for engaging the PTO drive mounted on the transmission output shaft.

- 00 Enable switch off – PTO operation not desired
- 01 Enable switch off – PTO operation desired
- 10 Error
- 11 Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64932                    |                                       |

**SPN 3455      *Enable Switch – Transfer case output shaft PTO***

Status of the operator's switch or other input which indicates the desire for engaging the PTO drive mounted on the output shaft of the transfer case.

- 00 Enable switch off – PTO operation not desired
- 01 Enable switch off – PTO operation desired
- 10 Error
- 11 Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64932                    |                                       |

**SPN 3456      *Engagement Consent – Transmission input shaft PTO 1***

Status of the transmission controller's consent to engage the first or sole PTO drive mounted on the transmission case. The controller in charge of the PTO drive should monitor this parameter and only engage the drive when consent is given. If consent is removed, while the PTO drive is engaged, the drive controller should disengage the drive as soon as possible. Engaging the drive or continuing drive engagement when consent is removed may result in damage to the transmission and / or the PTO drive mechanism.

- 00 Consent not given – PTO drive should not be engaged
- 01 Consent given – PTO drive may be engaged
- 10 Error
- 11 Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64932                    |                                       |



**SPN 3457      Engagement Consent – Transmission input shaft PTO 2**

Status of the transmission controller's consent to engage the second PTO drive mounted on the transmission case. The controller in charge of the PTO drive should monitor this parameter and only engage the drive when consent is given. If consent is removed while the PTO drive is engaged, the drive controller should disengage the drive as soon as possible. Engaging the drive or continuing drive engagement when consent is removed may result in damage to the transmission and / or the PTO drive mechanism. If there is only one PTO drive on the transmission case, use SPN 3456 Engagement Consent – Transmission input shaft PTO 1.

- 00 Consent not given – PTO drive should not be engaged
- 01 Consent given – PTO drive may be engaged
- 10 Error
- 11 Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64932                    |                                       |

**SPN 3458      Engagement Consent – Transmission output shaft PTO**

Status of the transmission controller's consent to engage the PTO drive connected to the transmission output shaft. The controller in charge of the PTO drive should monitor this parameter and only engage the drive when consent is given. If consent is removed, while the PTO drive is engaged, the drive controller should disengage the drive as soon as possible. Engaging the drive or continuing drive engagement when consent is removed may result in damage to the transmission and / or the PTO drive mechanism.

- 00 Consent not given – PTO drive should not be engaged
- 01 Consent given – PTO drive may be engaged
- 10 Error
- 11 Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64932                    |                                       |

**SPN 3459      Engagement Consent – Transfer case output shaft PTO**

Status of the transmission controller's consent to engage the PTO drive connected to the transfer case output shaft. The controller in charge of the PTO drive should monitor this parameter and only engage the drive when consent is given. If consent is removed, while the PTO drive is engaged, the drive controller should disengage the drive as soon as possible. Engaging the drive or continuing drive engagement when consent is removed may result in damage to the transmission and / or the PTO drive mechanism.

- 00 Consent not given – PTO drive should not be engaged
- 01 Consent given – PTO drive may be engaged
- 10 Error
- 11 Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64932                    |                                       |

**SPN 3460      Engagement Status – Transmission input shaft PTO 1**

Reports if this specific PTO drive is engaged. This parameter should be broadcast only by the controller(s) receiving feedback about the specific drive.

For example, a pressure switch may be used to determine if a PTO-driven pump has been engaged. If the Body Controller (SA33) were monitoring this feedback signal, it should be the node broadcasting this parameter.

- 00 Drive not engaged
- 01 Drive is engaged
- 10 Error
- 11 Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64932                    |                                       |

**SPN 3461      Engagement Status – Transmission input shaft PTO 2**

Reports if this specific PTO drive is engaged. This parameter should be broadcast only by the controller(s) receiving feedback about the specific drive.

For example, a pressure switch may be used to determine if a PTO-driven pump has been engaged. If the Body Controller (SA33) were monitoring this feedback signal, it should be the node broadcasting this parameter.

If there is only one PTO drive on the transmission case, SPN 3460 Engagement Status – Transmission input shaft PTO 1 should be used.

00 Drive not engaged  
01 Drive is engaged  
10 Error  
11 Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64932                    |                                       |

**SPN 3462      Engagement Status – Transmission output shaft PTO**

Reports if this specific PTO drive is engaged. This parameter should be broadcast only by the controller(s) receiving feedback about the specific drive.

For example, a pressure switch may be used to determine if a PTO-driven pump has been engaged. If the Body Controller (SA33) were monitoring this feedback signal, it should be the node broadcasting this parameter.

00 Drive not engaged  
01 Drive is engaged  
10 Error  
11 Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64932                    |                                       |

**SPN 3463      Engagement Status – Transfer case output shaft PTO**

Reports if this specific PTO drive is engaged. This parameter should be broadcast only by the controller(s) receiving feedback about the specific drive.

For example, a pressure switch may be used to determine if a PTO-driven pump has been engaged. If the Body Controller (SA33) were monitoring this feedback signal, it should be the node broadcasting this parameter.

00 Drive not engaged  
01 Drive is engaged  
10 Error  
11 Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64932                    |                                       |

**SPN 3464      Engine Throttle Actuator 1 Control Command**

The control command to throttle actuator 1, normalized to percent, where 0% represents fully closed and 100% represents fully open. Typically, this throttle actuator is used to regulate air or air / fuel mix to the engine. Using the standard convention for determining the position. Left/front is #1 and right/rear is #2 (SPN 3465).

|                         |                        |                              |
|-------------------------|------------------------|------------------------------|
| Data Length:            | 2 bytes                |                              |
| Resolution:             | 0.0025 %/bit, 0 offset |                              |
| Data Range:             | 0 to 160.6375 %        | Operational Range: 0 to 100% |
| Type:                   | Status                 |                              |
| Supporting Information: |                        |                              |
| PGN reference:          | 61466                  |                              |

**SPN 3465      Engine Throttle Actuator 2 Control Command**

The control command to throttle actuator 2, normalized to percent, where 0% represents fully closed and 100% represents fully open. Typically, this throttle actuator is used to regulate air or air / fuel mix to the engine. Using the standard convention for determining the position. Left/front is #1 (SPN 3464) and right/rear is #2.

|                         |                        |                              |
|-------------------------|------------------------|------------------------------|
| Data Length:            | 2 bytes                |                              |
| Resolution:             | 0.0025 %/bit, 0 offset |                              |
| Data Range:             | 0 to 160.6375 %        | Operational Range: 0 to 100% |
| Type:                   | Status                 |                              |
| Supporting Information: |                        |                              |
| PGN reference:          | 61466                  |                              |

**(R) SPN 3466      Engine Fuel Valve 2 Intake Absolute Pressure**

Absolute pressure of gas on intake side of the second fuel system control valve, using standard convention for determining position. Left/front is #1 (SPN 1390) and right/rear is #2.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64930                 |                                       |

**SPN 3467      Engine Gas 2 Mass Flow Rate**

Gas mass flow rate delivered to an engine through its second fuel control system, using standard convention for determining position. Left/front is #1 (SPN 1241) and right/rear is #2.

|                         |                             |                                       |
|-------------------------|-----------------------------|---------------------------------------|
| Data Length:            | 2 bytes                     |                                       |
| Resolution:             | 0.05 kg/h per bit, 0 offset |                                       |
| Data Range:             | 0 to 3212.75 kg/h           | Operational Range: same as data range |
| Type:                   | Measured                    |                                       |
| Supporting Information: |                             |                                       |
| PGN reference:          | 64930                       |                                       |

**SPN 3468      Engine Fuel Temperature 2**

Temperature 2 of fuel (or gas). See SPN 174 for fuel temperature 1.

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 deg C/bit, -40 deg C offset |                                       |
| Data Range:             | -40 to 210 deg C              | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          | 64930                         |                                       |

**SPN 3469      Engine Fuel Valve 2 Outlet Absolute Pressure**

Absolute pressure of gas on outlet side of the second fuel system control valve. See SPN 2980 for the first or only fuel system control valve.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64930                 |                                       |

**(R) SPN 3470      Engine Turbocharger Compressor Bypass Actuator 1 Command**

The command to a compressor bypass actuator, normalized to percent, where 0% nominally represents fully closed and 100% represents fully open. Typically, the turbocharger compressor bypass actuator is used to keep the engine out of surge by metering compressed air (charge).

Data Length: 2 bytes  
Resolution: 0.0025 %/bit, 0 offset  
Data Range: 0 to 160.6375 %  
Type: Status  
Supporting Information:  
PGN reference: 64931

Operational Range: 0 to 100%

**(R) SPN 3479      Aftertreatment 1 Fuel Pressure 1 Control**

Position that the controller is commanding the aftertreatment 1 fuel pressure control to maintain. 0% = fully closed, 100% = fully open.

Data Length: 2 bytes  
Resolution: 0.0025 %/bit, 0 offset  
Data Range: 0 to 160.6375 %  
Type: Status  
Supporting Information:  
PGN reference: 64929

Operational Range: same as data range

**SPN 3480      Aftertreatment 1 Fuel Pressure 1**

First fuel pressure measurement for the aftertreatment 1 system

Data Length: 2 bytes  
Resolution: 0.1 kPa/bit, 0 offset  
Data Range: 0 to 6,425.5 kPa  
Type: Measured  
Supporting Information:  
PGN reference: 64929

Operational Range: same as data range

**SPN 3481      Aftertreatment 1 Fuel Rate**

Rate of fuel being delivered to aftertreatment 1 for regeneration

Data Length: 2 bytes  
Resolution: 0.05 L/h per bit, 0 offset  
Data Range: 0 to 3,212.75 L/h  
Type: Measured  
Supporting Information:  
PGN reference: 64929

Operational Range: same as data range

**SPN 3482      *Aftertreatment 1 Fuel Enable Actuator***

Indicates whether aftertreatment 1 fuel enable actuator is on or off

00 not active  
01 active  
10 reserved for SAE assignment  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 64929

Operational Range: same as data range

**SPN 3483      *Aftertreatment 1 Regeneration Status***

Indicates whether regeneration is active or inactive in aftertreatment 1.

00 not active  
01 active  
10 reserved for SAE assignment  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 64929

Operational Range: same as data range

**SPN 3484      *Aftertreatment 1 Ignition***

Indicates whether aftertreatment 1 ignition circuit is energized by the ECM.

00 not active  
01 active  
10 reserved for SAE assignment  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 64929

Operational Range: same as data range

**SPN 3485      *Aftertreatment 1 Supply Air Pressure***

Pressure of the supply air for aftertreatment 1. Supply air is the air supplied from a pneumatic line for an air-assisted or pneumatic actuator. One example is an air assisted fuel injector (the supply air assists in the atomization of fuel).

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64927                 |                                       |

**SPN 3486      *Aftertreatment 1 Purge Air Pressure***

Pressure of the purge air supply for aftertreatment 1

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64927                 |                                       |

**SPN 3487      *Aftertreatment 1 Air Pressure Control***

Position that the controller is commanding the aftertreatment 1 air pressure control to maintain. 0% = fully closed, 100% = fully open

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 2 bytes                |                                       |
| Resolution:             | 0.0025 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 160.6375 %        | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 64927                  |                                       |

**SPN 3488      *Aftertreatment 1 Air Pressure Actuator Position***

Position of the aftertreatment 1 air pressure actuator as measured by a position feedback sensor.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64927               |                                       |



**SPN 3489      *Aftertreatment 1 Air Enable Actuator***

Indicates whether aftertreatment 1 air enable actuator is on or off

00 not active  
01 active  
10 reserved for SAE assignment  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 64927

Operational Range: same as data range

**SPN 3490      *Aftertreatment 1 Purge Air Actuator***

Indicates whether aftertreatment 1 purge air actuator is on or off

00 not active  
01 active  
10 reserved for SAE assignment  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 64927

Operational Range: same as data range

**SPN 3491      *Aftertreatment 1 Atomization Air Actuator***

Indicates whether aftertreatment 1 atomization air actuator is on or off

00 not active  
01 active  
10 reserved for SAE assignment  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 64927

Operational Range: same as data range

**SPN 3492      *Aftertreatment 1 Air System Relay***

Indicates whether aftertreatment 1 air system relay is on or off

00 not active  
01 active  
10 reserved for SAE assignment  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 64927

Operational Range: same as data range

**(R) SPN 3493      *Aftertreatment 2 Fuel Pressure 1 Control***

Position that the controller is commanding the aftertreatment 2 fuel pressure control to maintain. 0% = fully closed, 100% = fully open.

Data Length: 2 bytes  
Resolution: 0.0025 %/bit, 0 offset  
Data Range: 0 to 160.6375 %  
Type: Status  
Supporting Information:  
PGN reference: 64928

Operational Range: same as data range

**SPN 3494      *Aftertreatment 2 Fuel Pressure 1***

Pressure of the fuel for Aftertreatment 2.

Data Length: 2 bytes  
Resolution: 0.1 kPa/bit, 0 offset  
Data Range: 0 to 6,425.5 kPa  
Type: Measured  
Supporting Information:  
PGN reference: 64928

Operational Range: same as data range

**SPN 3495      *Aftertreatment 2 Fuel Rate***

Rate of fuel being delivered to aftertreatment 2 for regeneration

Data Length: 2 bytes  
Resolution: 0.05 L/h per bit, 0 offset  
Data Range: 0 to 3,212.75 L/h  
Type: Measured  
Supporting Information:  
PGN reference: 64928

Operational Range: same as data range

**SPN 3496      *Aftertreatment 2 Fuel Enable Actuator***

Indicates whether aftertreatment 2 fuel enable actuator is on or off

00 not active  
01 active  
10 reserved for SAE assignment  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 64928

Operational Range: same as data range

**SPN 3497      *Aftertreatment 2 Regeneration Status***

Indicates whether regeneration is active or inactive in aftertreatment 2.

00 not active  
01 active  
10 reserved for SAE assignment  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 64928

Operational Range: same as data range

**SPN 3498      *Aftertreatment 2 Ignition***

Indicates whether aftertreatment 2 ignition circuit is energized by the ECM.

00 not active  
01 active  
10 reserved for SAE assignment  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 64928

Operational Range: same as data range

**SPN 3499      *Aftertreatment 2 Supply Air Pressure***

Pressure of the supply air for aftertreatment 2. Supply air is the air supplied from a pneumatic line for an air-assisted or pneumatic actuator. One example is an air assisted fuel injector (the supply air assists in the atomization of fuel).

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64926                 |                                       |

**SPN 3500      *Aftertreatment 2 Purge Air Pressure***

Pressure of the purge air supply for aftertreatment 2

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64926                 |                                       |

**SPN 3501      *Aftertreatment 2 Air Pressure Control***

Position that the controller is commanding the aftertreatment 2 air pressure control to maintain. 0% = fully closed, 100% = fully open

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 2 bytes                |                                       |
| Resolution:             | 0.0025 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 160.6375 %        | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 64926                  |                                       |

**SPN 3502      *Aftertreatment 2 Air Pressure Actuator Position***

Position of the aftertreatment 2 air pressure actuator as measured by a position feedback sensor.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64926               |                                       |

**SPN 3503      *Aftertreatment 2 Air Enable Actuator***

Indicates whether aftertreatment 2 air enable actuator is on or off

00 not active  
01 active  
10 reserved for SAE assignment  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 64926

Operational Range: same as data range

**SPN 3504      *Aftertreatment 2 Purge Air Actuator***

Indicates whether aftertreatment 2 purge air actuator is on or off

00 not active  
01 active  
10 reserved for SAE assignment  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 64926

Operational Range: same as data range

**SPN 3505      *Aftertreatment 2 Atomization Air Actuator***

Indicates whether aftertreatment 2 atomization air actuator is on or off

00 not active  
01 active  
10 reserved for SAE assignment  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 64926

Operational Range: same as data range

**SPN 3506      Aftertreatment 2 Air System Relay**

Indicates whether aftertreatment 2 air system relay is on or off

00 not active  
01 active  
10 reserved for SAE assignment  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 64926

Operational Range: same as data range

**SPN 3509      Sensor supply voltage 1**

Sensor ECU supply voltage 1

Data Length: 2 bytes  
Resolution: 0.05 V/bit, 0 offset  
Data Range: 0 to 3212.75 V  
Type: Measured  
Supporting Information:  
PGN reference: 64925

Operational Range: same as data range

**SPN 3510      Sensor supply voltage 2**

Sensor ECU supply voltage 2

Data Length: 2 bytes  
Resolution: 0.05 V/bit, 0 offset  
Data Range: 0 to 3212.75 V  
Type: Measured  
Supporting Information:  
PGN reference: 64925

Operational Range: same as data range

**SPN 3511      Sensor supply voltage 3**

Sensor ECU supply voltage 3

Data Length: 2 bytes  
Resolution: 0.05 V/bit, 0 offset  
Data Range: 0 to 3212.75 V  
Type: Measured  
Supporting Information:  
PGN reference: 64925

Operational Range: same as data range

**SPN 3512      Sensor supply voltage 4**

Sensor ECU supply voltage 4

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 2 bytes              |                                       |
| Resolution:             | 0.05 V/bit, 0 offset |                                       |
| Data Range:             | 0 to 3212.75 V       | Operational Range: same as data range |
| Type:                   | Measured             |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 64925                |                                       |

**SPN 3513      Sensor supply voltage 5**

Sensor ECU supply voltage 5

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 2 bytes              |                                       |
| Resolution:             | 0.05 V/bit, 0 offset |                                       |
| Data Range:             | 0 to 3212.75 V       | Operational Range: same as data range |
| Type:                   | Measured             |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 64924                |                                       |

**SPN 3514      Sensor supply voltage 6**

Sensor ECU supply voltage 6

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 2 bytes              |                                       |
| Resolution:             | 0.05 V/bit, 0 offset |                                       |
| Data Range:             | 0 to 3212.75 V       | Operational Range: same as data range |
| Type:                   | Measured             |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 64924                |                                       |

**SPN 3515      Aftertreatment 1 SCR Catalyst Reagent Temperature 2**

Temperature of the catalyst reagent at the device measuring reagent quality

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 deg C/bit, -40 deg C offset |                                       |
| Data Range:             | -40 to 210 deg C              | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: | See Appendix D - SPN 1761     |                                       |
| PGN reference:          | 64923                         |                                       |

**SPN 3516      *Aftertreatment 1 SCR Catalyst Reagent Concentration***

A measure of the concentration of urea in water. Zero percent means that the tank contains no urea. A 32.5% value indicates that the reagent is of the proper concentration. The 32.5% value indicates that the concentration is highest quality.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 1 byte                    |                                       |
| Resolution:             | 0.25 %/bit, 0 offset      |                                       |
| Data Range:             | 0 to 62.5 %               | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: | See Appendix D - SPN 1761 |                                       |
| PGN reference:          | 64923                     |                                       |

**SPN 3517      *Aftertreatment 1 SCR Catalyst Tank Level 2***

The measure of the reagent level in the catalyst tank.

|                         |                                 |                                       |
|-------------------------|---------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                         |                                       |
| Resolution:             | 0.1 mm/bit, 0 offset            |                                       |
| Data Range:             | 0 to 6,425.5 mm (0 to 6.4255 m) | Operational Range: same as data range |
| Type:                   | Measured                        |                                       |
| Supporting Information: | See Appendix D - SPN 1761       |                                       |
| PGN reference:          | 65110                           |                                       |

**SPN 3518      *Aftertreatment 1 SCR Catalyst Reagent Conductivity***

A measure of the conductivity of the reagent or fluid at the sensor. The conductivity is an indication of the reagent's chemical make up.

|                         |                             |                                       |
|-------------------------|-----------------------------|---------------------------------------|
| Data Length:            | 1 byte                      |                                       |
| Resolution:             | 5 microSiemens/mm, 0 offset |                                       |
| Data Range:             | 0 to 1250 microSiemens/mm   | Operational Range: same as data range |
| Type:                   | Measured                    |                                       |
| Supporting Information: | See Appendix D - SPN 1761   |                                       |
| PGN reference:          | 64923                       |                                       |

**SPN 3519      *Aftertreatment 1 SCR Catalyst Reagent Temperature 2 Preliminary FMI***

Used to identify the applicable J1939-73 FMI that applies to the most significant failure of the catalyst temperature sensor. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 64923            |                                       |



**SPN 3520      *Aftertreatment 1 SCR Catalyst Reagent Properties Preliminary FMI***

Used to identify the applicable J1939-73 FMI that applies to the most significant failure of the catalyst reagent properties sensor. This may be used for indicating failures of the catalyst reagent concentration, catalyst reagent conductivity or catalyst reagent type. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 64923            |                                       |

**SPN 3521      *Aftertreatment 1 SCR Catalyst Reagent Type***

This parameter indicates what reagent is in the tank. A value of 0011 indicates uncontaminated Diesel Exhaust Fluid.

0000 - Catalyst reagent is urea concentration too high  
0001 - Catalyst reagent is urea concentration too low  
0010 - Catalyst reagent is diesel  
0011 - Catalyst reagent is proper mixture  
0101 to 1100 - Reserved for SAE assignment  
1101 - Not able to determine catalyst reagent type (type unknown)  
1110 - Error detected with urea reagent type detection  
1111 - Not available

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: | See Appendix D - SPN 1761 |                                       |
| PGN reference:          | 64923                     |                                       |

**SPN 3522      *Aftertreatment 1 Total Fuel Used***

Total amount of fuel used by aftertreatment device 1 over the lifetime of the device.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.5 L/bit, 0 offset    |                                       |
| Data Range:             | 0 to 2,105,540,607.5 L | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 64920                  |                                       |

**SPN 3523      *Aftertreatment 1 Total Regeneration Time***

Total amount of time that aftertreatment device 1 has been regenerating over the lifetime of the device.

Data Length: 4 bytes  
Resolution: 1 s/bit, 0 offset  
Data Range: 0 to 4,211,081,215 s      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 64920

**SPN 3524      *Aftertreatment 1 Total Disabled Time***

Total amount of time that aftertreatment 1 regeneration has been manually disabled.

Data Length: 4 bytes  
Resolution: 1 s/bit, 0 offset  
Data Range: 0 to 4,211,081,215 s      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 64920

**SPN 3525      *Aftertreatment 1 Total Number of Active Regenerations***

Total number of active regenerations by aftertreatment device 1 over the lifetime of the device.

Data Length: 4 bytes  
Resolution: 1 count/bit, 0 offset  
Data Range: 0 to 4,294,967,295 counts      Operational Range: same as data range  
Type: Status  
Supporting Information:  
PGN reference: 64920

**SPN 3526      *Aftertreatment 2 Total Fuel Used***

Total amount of fuel used by aftertreatment device 2 over the lifetime of the device.

Data Length: 4 bytes  
Resolution: 0.5 L/bit, 0 offset  
Data Range: 0 to 2,105,540,607.5 L      Operational Range: same as data range  
Type: Status  
Supporting Information:  
PGN reference: 64921

**SPN 3527      *Aftertreatment 2 Total Regeneration Time***

Total amount of time that aftertreatment device 2 has been regenerating over the lifetime of the device.

Data Length: 4 bytes  
Resolution: 1 s/bit, 0 offset  
Data Range: 0 to 4,211,081,215 s      Operational Range: same as data range  
Type: Status  
Supporting Information:  
PGN reference: 64921

**SPN 3528      *Aftertreatment 2 Total Disabled Time***

Total amount of time that aftertreatment 2 regeneration has been manually disabled.

Data Length: 4 bytes  
Resolution: 1 s/bit, 0 offset  
Data Range: 0 to 4,211,081,215 s      Operational Range: same as data range  
Type: Status  
Supporting Information:  
PGN reference: 64921

**SPN 3529      *Aftertreatment 2 Total Number of Active Regenerations***

Total number of active regenerations by aftertreatment device 2 over the lifetime of the device.

Data Length: 4 bytes  
Resolution: 1 count/bit, 0 offset  
Data Range: 0 to 4,294,967,295 counts      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 64921

**SPN 3532      *Aftertreatment 1 SCR Catalyst Tank Level Preliminary FMI***

Used to identify the applicable J1939-73 FMI that applies to the most significant failure of the catalyst tank level sensor. This FMI is applicable to either the catalyst tank level 1 or catalyst tank level 2 parameters.

Data Length: 5 bits  
Resolution: Binary, 0 offset  
Data Range: 0 to 31      Operational Range: same as data range  
Type: Status  
Supporting Information:  
PGN reference: 65110

**SPN 3533      *Transmission Oil Level Switch***

This switch indicates whether transmission oil level is full or empty.

00 - Empty  
01 - Full or not empty  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64917

Operational Range: same as data range

**SPN 3543*****Engine Operating State***

This parameter is used to indicate the current state, or mode, of operation by the engine. This is a status parameter.

Bit state 0000 = Engine Stopped

Bit state 0001 = Pre-Start

Bit state 0010 = Starting

Bit state 0011 = Warm-Up

Bit state 0100 = Running

Bit state 0101 = Cool-down

Bit state 0110 = Engine Stopping

Bit state 0111 = Post-Run

Bit states 1000-1101 = available for SAE assignment

Bit state 1110 = <reserved>

Bit state 1111 = not available

**STOPPED -**

In the stopped state, the ECM is powered and the engine is not turning. The engine is ready to start.

**PRE-START -**

In the PRE-START state, the engine is not running. Actions are taken by various subsystem controls to prepare the engine for cranking and starting. This may include any priming, prelubrication, preheating sequences, interlocks or other start permissives. These subsystems have their own state based control and communicate their status to the engine state control logic.

**STARTING -**

During the STARTING state, actions are taken by various subsystem controls to attempt to start the engine.

**WARM-UP -**

During the WARM-UP state, the engine operates at reduced speed and / or load to allow the engine to come up to operating temperature.

**RUNNING -**

In the RUNNING state, the engine is turning and is prepared to output power.

**COOL-DOWN -**

During the COOLDOWN state, the engine operates at reduced speed and / or load to allow the engine to cool off before the engine is stopped.

**STOPPING -**

In the STOPPING state, actions are taken by various subsystem controls to attempt to stop the engine.

**POST-RUN -**

During the POST-RUN state, the engine is not turning. Actions are taken by various subsystem controls to prevent engine damage and extend component life. The engine is not ready to start.

Data Length: 4 bits

Resolution: 16 states/4 bit, 0 offset

Data Range: 0 to 15

Type: Status

Supporting Information:

PGN reference: 64914

Operational Range: same as data range

**SPN 3544      *Time Remaining in Engine Operating State***

This parameter is used to indicate the time remaining in the current engine operating state, based on the state defined in the SPN "Engine Operating State" (SPN 3543). For the states in which time remaining is not applicable, use 65535 (\$FFFF).

|                         |                   |                                       |
|-------------------------|-------------------|---------------------------------------|
| Data Length:            | 2 bytes           |                                       |
| Resolution:             | 1 s/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 s     | Operational Range: same as data range |
| Type:                   | Status            |                                       |
| Supporting Information: |                   |                                       |
| PGN reference:          | 64914             |                                       |

**SPN 3548      *Engine Waste Oil Reservoir Level***

Level of crankcase blowby emulsion collected by a container. Normalized to percent, 0% represents completely empty and 100% represents completely full.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65130               |                                       |

**SPN 3549      *Engine Oil-Filter Outlet Pressure***

Oil pressure (gauge) measured just downstream of oil filter. Used in conjunction with SPN1208 (pre-filter oil pressure) to determine oil filter health.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 4 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 1000 kPa       | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65130               |                                       |

**SPN 3550      *Engine Oil Priming Pump Switch***

Switch input for activating the engine oil priming pump.

00 = Off  
01 = On  
10 = Error  
11 = Not available or not installed

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65130                    |                                       |

**SPN 3551      Engine Oil Priming State**

Determination of whether or not the engine is (or has recently been) sufficiently lubricated for starting purposes.

00 = Not sufficiently lubricated  
01 = Sufficiently lubricated  
10 = Unable to determine if sufficiently lubricated  
11 = Not available or not installed

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65130                    |                                       |

**SPN 3552      Engine Oil Pre-Heated State**

Indicates whether the engine oil pre-heated sufficiently for starting purposes.

00 = Not sufficiently pre-heated  
01 = Sufficiently pre-heated  
10 = Unable to determine if engine oil is pre-heated sufficiently  
11 = Not available or not installed

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65130                    |                                       |

**SPN 3553      Engine Coolant Pre-heated State**

Indicates whether the engine coolant is pre-heated sufficiently for starting purposes.

00 = Not sufficiently pre-heated  
01 = Sufficiently pre-heated  
10 = Unable to determine engine coolant pre-heated sufficiently  
11 = Not available or not installed

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65130                    |                                       |

**SPN 3554      Engine Ventilation Status**

Engine ventilation control states.

000 = Sufficiently vented (all combustible gases have been evacuated from intake and exhaust systems)  
001 = Ventilation needed (combustible gases may be present in intake and exhaust systems)  
010 = Ventilation delay (delay without cranking between ventilation and start engine states)  
011 = Currently venting (engine cranks w/o gas or ignition to clear intake and exhaust systems with air)  
100 = Reserved for SAE assignment  
101 = Reserved for SAE assignment  
110 = Not able to determine if sufficiently vented  
111 = Not available or not installed

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 3 bits                   |                                       |
| Resolution:             | 8 states/3 bit, 0 offset |                                       |
| Data Range:             | 0 to 7                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65130                    |                                       |

**SPN 3557      Parking Brake Red Warning Signal**

This parameter commands the Parking Brake red optical warning signal.

00 – off  
01 – on  
10 – Reserved  
11 – Take no action

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65274                    |                                       |

**SPN 3558      AETC Data Collection Standard**

Indicates the standardized method by which torque data was obtained for the Advertised Engine Torque Curve (AETC). For example, in North America, heavy duty diesel engine specifications are typically based on SAE J1995. Other applicable SAE, ISO, or DIN standards may be added as necessary in the future.

|           |               |
|-----------|---------------|
| 0000      | SAE J1995     |
| 0001-1101 | Not Defined   |
| 1111      | Not Available |

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64912                     |                                       |



**SPN 3559      *Number of AETC data points***

Indicates the number of speed / torque data points contained in the Advertised Engine Torque Curve broadcast (AETC). A minimum of 5 points is required, with a maximum of 15 points available as needed to accurately convey the curve.

|                         |                            |                                   |
|-------------------------|----------------------------|-----------------------------------|
| Data Length:            | 4 bits                     |                                   |
| Resolution:             | 16 states/4 bit, 0 offset  |                                   |
| Data Range:             | 0 to 15                    | Operational Range: 5 to 15 points |
| Type:                   | Measured                   |                                   |
| Supporting Information: | See Appendix D - PGN 64912 |                                   |
| PGN reference:          | 64912                      |                                   |

**SPN 3560      *AETC Speed Value***

Engine speed value of the data points in PGN 64912 – Advertised Engine Torque Curve (AETC).

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bytes                    |                                       |
| Resolution:             | 0.125 rpm/bit, 0 offset    |                                       |
| Data Range:             | 0 to 8,031.875 rpm         | Operational Range: same as data range |
| Type:                   | Measured                   |                                       |
| Supporting Information: | See Appendix D - PGN 64912 |                                       |
| PGN reference:          | 64912                      |                                       |

**SPN 3561      *AETC Torque value***

Engine torque value of the data points in PGN 64912 – Advertised Engine Torque Curve (AETC).

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bytes                    |                                       |
| Resolution:             | 1 Nm/bit, 0 offset         |                                       |
| Data Range:             | 0 to 64,255 Nm             | Operational Range: same as data range |
| Type:                   | Measured                   |                                       |
| Supporting Information: | See Appendix D - PGN 64912 |                                       |
| PGN reference:          | 64912                      |                                       |

**SPN 3562      *Engine Intake Manifold #2 Pressure***

The gage pressure measurement of the air intake manifold for bank #2 or the second air intake manifold. If there are multiple air pressure sensors in the second intake stream, this is the last one in flow direction before entering the combustion chamber. See also SPNs 1127-1130 and SPN 102 for alternate range and resolution.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 2 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 500 kPa        | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64976               |                                       |

**SPN 3563      Engine Intake Manifold #1 Absolute Pressure**

The absolute pressure measurement of the air intake manifold. If there are multiple air pressure sensors in the intake stream, this is the last one in flow direction before entering the combustion chamber.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 2 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 500 kPa        | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64976               |                                       |

**SPN 3564      Lane Departure Warning Enable Command**

Command to enable/disable Lane Departure Indication

00 Disable Lane Departure Warning  
01 Enable Lane Departure Warning  
10 Reserved  
11 Don't care

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 43264                    |                                       |

**SPN 3565      Lane Departure Left**

Indicates that the middle of vehicle departs the lane on the left side. The parameter indicates that the vehicle is changing the lane to the left.

00 Middle of the vehicle does not depart the lane to the left side  
01 Middle of the vehicle departs the lane to the left side  
10 Reserved  
11 Take no action

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61447                    |                                       |

-----

**SPN 3566      Lane Departure Right**

Indicates that the middle of vehicle departs the lane on the right side. The parameter indicates that the vehicle is changing the lane to the right.

- 00 Middle of the vehicle does not depart the lane to the right side
- 01 Middle of the vehicle departs the lane to the right side
- 10 Reserved
- 11 Take no action

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61447                    |                                       |

**SPN 3589      Engine Oil Priming Pump Control**

This control is used to activate a pump that lubricates the engine, particularly prior to initial engine startup.

- 00 = Off
- 01 = On
- 10 = Reserved
- 11 = unavailable

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64914                    |                                       |

**SPN 3597      ECU Power Output Supply Voltage #1**

The first power output from an ECM

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 2 bytes              |                                       |
| Resolution:             | 0.05 V/bit, 0 offset |                                       |
| Data Range:             | 0 to 3212.75 V       | Operational Range: same as data range |
| Type:                   | Measured             |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 65165                |                                       |

**SPN 3598      ECU Power Output Supply Voltage #2**

The second power output from an ECM.

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 2 bytes              |                                       |
| Resolution:             | 0.05 V/bit, 0 offset |                                       |
| Data Range:             | 0 to 3212.75 V       | Operational Range: same as data range |
| Type:                   | Measured             |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 65165                |                                       |

**SPN 3599      ECU Power Output Supply Voltage #3**

The third power output from an ECM.

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 2 bytes              |                                       |
| Resolution:             | 0.05 V/bit, 0 offset |                                       |
| Data Range:             | 0 to 3212.75 V       | Operational Range: same as data range |
| Type:                   | Measured             |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 65165                |                                       |

**SPN 3600      Steering Straight Ahead Position Reset**

Used to reset the straight ahead position for a steering sensor in the steering column or a steering controller's straight ahead position on any steerable axle.

00 Take no action - Do not Reset  
01 Reset  
10 Reserved, take no action  
11 Not applicable

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 56832                    |                                       |

**SPN 3601      Engine Fuel Shutoff Valve Leak Test Control**

Control setting for fuel shutoff valve proving system test. Typically, this type of system can only be used with a dual fuel shutoff system. The test consists of a small pump to pressurize the chamber between the dual fuel shutoffs when they are closed. After pressurizing, the test is passed if the pressure is above a certain threshold, indicating the fuel shutoffs are sealed completely shut without leaks. Otherwise, a low pressure indicates a leak is present past one or both of the fuel shutoffs.

00 = Off (reset / no test in process)  
01 = On (test in process / test complete)  
10 = Reserved  
11 = Don't care / take no action

In addition to communicating desired action of the fuel shutoff valve proving system test and its driver status, this new SPN can be used to communicate whether the fuel shutoff valve proving system test failed, through the use of FMIs.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64914                    |                                       |

**SPN 3602      Engine Oil Pre-heater Control**

Control setting for an electrically actuated oil pre-heating device.

00 = Off  
01 = On  
10 = Reserved  
11 = Don't care / take no action

In addition to communicating desired action of the electrically actuated oil pre-heater and its driver status, this new SPN can be used to communicate if any attempts to adequately pre-heat the oil are unsuccessful, through the use of FMIs.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64914                    |                                       |

**SPN 3603      Engine Electrical System Power Conservation Control**

Control setting for cutting power to various devices when the engine is not in use. Useful if it is desired to keep the engine in standby, with main control ECM still powered on and communicating with outside world, but actuators and certain other ECMs can be de-powered.

00 - Off (No Power conservation; all systems with supply power available)  
01 - On (power conservation active; certain systems have supply power withheld)  
10 - Reserved  
11 - Unavailable

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64914                    |                                       |

**SPN 3604      Engine Block / Coolant Pre-heater Control**

Control setting for an electrically actuated engine block or coolant pre-heating device.

00 - Off  
01 - On  
10 - Reserved  
11 - Unavailable

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64914                    |                                       |

**SPN 3605      Engine Coolant Circulating Pump Control**

Control setting for an electrically actuated engine coolant circulating pump.

00 = Off  
01 = On  
10 = Reserved  
11 = Don't care / take no action

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64914                    |                                       |

**SPN 3606      Engine Controlled Shutdown Request**

A signal issued by the engine control system to a user or external system requesting for a controlled shutdown. This request is made when engine protection diagnostics determine a condition warrants a shutdown soon, but it is not severe enough to necessitate an immediate shutdown. This function gives notice such that the engine can be unloaded and cooled down before stopping.

00 = Off (No Shutdown Requested)

01 = On (Shutdown Requested)

10 = Reserved

11 = Don't care / take no action

Data Length:            2 bits

Resolution:            4 states/2 bit, 0 offset

Data Range:            0 to 3

Type:                    Status

Supporting Information:

PGN reference:        64914

Operational Range: same as data range

**SPN 3607      Engine Emergency (Immediate) Shutdown Indication**

A signal issued by the engine control system to a user or external system indicating that it is immediately shutting the engine down. This indication is made when engine protection diagnostics determine a condition necessitates an immediate shutdown. This function gives notice that this has occurred.

00 = Off (No Shutdown Requested)

01 = On (Shutdown Requested)

10 = Reserved

11 = Don't care / take no action

Data Length:            2 bits

Resolution:            4 states/2 bit, 0 offset

Data Range:            0 to 3

Type:                    Status

Supporting Information:

PGN reference:        64914

Operational Range: same as data range

**SPN 3608      Engine Fuel Shutoff Vent Control**

Control setting for a fuel shutoff vent. Typically, for a dual fuel shutoff system, the vent line is located between them and is plumbed to vent outside to atmosphere. The vent control typically always actuates opposite to that of the fuel shutoff(s) control. Thus, when the fuel shutoff(s) are closed, the vent is open, thereby 'ventilating' any leftover or leaking gas from the fuel shutoff. When the fuel shutoff(s) are open, the vent is closed, thereby all gas passes through to the engine.

00 = Closed (vent closed)  
01 = Open (vent open)  
10 = Reserved  
11 = Don't care / take no action

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64914                    |                                       |

**SPN 3609      Diesel Particulate Filter Intake Pressure 1**

This parameter indicates the diesel particulate filter intake gage pressure 1 (bank 1).

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64908                 |                                       |

**SPN 3610      Diesel Particulate Filter Outlet Pressure 1**

This parameter indicates the diesel particulate filter outlet gage pressure 1 (bank 1).

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64908                 |                                       |

**SPN 3611      Diesel Particulate Filter Intake Pressure 2**

This parameter indicates the diesel particulate filter intake gage pressure 2 (bank 2).

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64907                 |                                       |



**SPN 3612 Diesel Particulate Filter Outlet Pressure 2**

This parameter indicates the diesel particulate filter outlet gage pressure 2 (bank 2).

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64907                 |                                       |

**(R) SPN 3613 Text Display Instructions**

This parameter describes the status for the display how to show the information.

0000 Clear display - The displayed information should be deleted or not displayed any more.

0001 Hold display - The presently displayed information should be retained

0010 Append at end of display - The transmitted information should be displayed at the end of the presently displayed information

0011 Overwrite display - The presently displayed information is to be overwritten with the transmitted information

0100 Overwrite substring - A portion of the presently displayed information is to be overwritten with the transmitted information starting at display text index (SPN 3614)

0101 Highlight substring

0110 Blink substring

0111-1110 Reserved

1111 - Not applicable

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 43008                     |                                       |

**SPN 3614 Text Display Index**

Used for overwriting consecutive bytes of a displayed string when byte 1 "Text Display Instructions" state is set for "overwrite substring" mode. When used, this byte declares where in the text string that the new text will start overwriting, this number is also known as the start byte. As usual for the transmitted text string, the Text Display Characters will be sent and then terminated by the null character, this will be the stop byte indicator to declare when to stop overwriting.

EXAMPLE: To only modify 3 bytes (50, 51, 52) of an 87 byte character string.

Text Display Instructions - set to 0100b (Overwrite substring)

Text Display Index - set to 50d (starting byte of desired overwrite)

Text Display Characters - 3 characters sent, then the null ending byte

|                         |                       |                             |
|-------------------------|-----------------------|-----------------------------|
| Data Length:            | 1 byte                |                             |
| Resolution:             | 1 count/bit, 0 offset |                             |
| Data Range:             | 0 to 250              | Operational Range: 0 to 200 |
| Type:                   | Status                |                             |
| Supporting Information: |                       |                             |
| PGN reference:          | 43008                 |                             |

**SPN 3615      Text Display Character**

From 1 up to 200 characters to be presented on a display. Up to 4 characters can be displayed without using Transport Protocol. The Display Text characters will follow the standard J1939-71 display method. Control characters can be used but not displayed. The characters are to be terminated with a 00h which is the "null" or "/0" character.

EXAMPLE: Since this parameter starts in byte position 4, the first displayed byte would be in byte 4 of the Data Frame, the fourth displayed byte would be in byte 7 of the Data Frame, byte 8 would be the null character.

|                         |                                                          |                                       |  |
|-------------------------|----------------------------------------------------------|---------------------------------------|--|
| Data Length:            | Variable - up to 200 bytes followed by an NULL delimiter |                                       |  |
| Resolution:             | ASCII, 0 offset                                          |                                       |  |
| Data Range:             | 0 to 255 per byte                                        | Operational Range: same as data range |  |
| Type:                   | Status                                                   |                                       |  |
| Supporting Information: |                                                          |                                       |  |
| PGN reference:          | 43008                                                    |                                       |  |

**SPN 3619      Number of J2012 DTCs**

The number J2012 DTCs being conveyed in PGN 64906. If the value of this parameter is zero, the device broadcasting PGN 64906 has no active or previously active J2012 DTCs.

|                         |                       |                                       |  |
|-------------------------|-----------------------|---------------------------------------|--|
| Data Length:            | 1 byte                |                                       |  |
| Resolution:             | 1 count/bit, 0 offset |                                       |  |
| Data Range:             | 0 to 250              | Operational Range: same as data range |  |
| Type:                   | Measured              |                                       |  |
| Supporting Information: |                       |                                       |  |
| PGN reference:          | 64906                 |                                       |  |

**SPN 3620      J2012 DTC**

Five character ASCII SAE J2012 DTC, sent most significant byte first.

|                         |                   |                                       |  |
|-------------------------|-------------------|---------------------------------------|--|
| Data Length:            | 5 bytes           |                                       |  |
| Resolution:             | ASCII, 0 offset   |                                       |  |
| Data Range:             | 0 to 255 per byte | Operational Range: same as data range |  |
| Type:                   | Measured          |                                       |  |
| Supporting Information: |                   |                                       |  |
| PGN reference:          | 64906             |                                       |  |

**SPN 3621      J2012 DTC Status**

Indicates if the respective SAE J2012 DTC is active or previously active.

0 - DTC is previously active  
1 - DTC is active

|                         |                          |                                       |  |
|-------------------------|--------------------------|---------------------------------------|--|
| Data Length:            | 1 bit                    |                                       |  |
| Resolution:             | 2 states/1 bit, 0 offset |                                       |  |
| Data Range:             | 0 to 1                   | Operational Range: same as data range |  |
| Type:                   | Measured                 |                                       |  |
| Supporting Information: |                          |                                       |  |
| PGN reference:          | 64906                    |                                       |  |

**SPN 3622      J2012 DTC Occurrence Count**

Number of occurrences of the respective SAE J2012 DTC being conveyed.  
If more than 126 occurrences happen the value shall be set to 126.  
If the occurrence count is not available to be sent then this value shall be set to 127.

|                         |                       |                             |
|-------------------------|-----------------------|-----------------------------|
| Data Length:            | 7 bits                |                             |
| Resolution:             | 1 count/bit, 0 offset |                             |
| Data Range:             | 0 to 127              | Operational Range: 0 to 126 |
| Type:                   | Measured              |                             |
| Supporting Information: |                       |                             |
| PGN reference:          | 64906                 |                             |

**SPN 3623      Vehicle Roll**

This parameter indicates the roll in degrees from level. Facing the direction of travel a tip to the left would be indicated by a negative number and a tip to the right would be indicated by a positive number.

|                         |                                |                                      |
|-------------------------|--------------------------------|--------------------------------------|
| Data Length:            | 2 bytes                        |                                      |
| Resolution:             | 1/128 deg/bit, -200 deg offset |                                      |
| Data Range:             | -200 to 301.99 deg             | Operational Range: -90 to 90 degrees |
| Type:                   | Measured                       |                                      |
| Supporting Information: |                                |                                      |
| PGN reference:          | 64905                          |                                      |

**SPN 3624      Engine Intake Valve Actuation Oil Pressure for Cylinder #1**

The gage pressure of the oil in the hydraulic accumulator that powers the engine intake valve for cylinder #1.

This intake valve pressure is at the first cylinder in the engine, while SPN 2948 reflects the intake valve pressure of the entire engine system.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64904                 |                                       |

**SPN 3625      Engine Intake Valve Actuation Oil Pressure for Cylinder #2**

The gage pressure of the oil in the hydraulic accumulator that powers the engine intake valve for cylinder #2.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64904                 |                                       |

**SPN 3626      Engine Intake Valve Actuation Oil Pressure for Cylinder #3**

The gage pressure of the oil in the hydraulic accumulator that powers the engine intake valve for cylinder #3.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64904                 |                                       |

**SPN 3627      Engine Intake Valve Actuation Oil Pressure for Cylinder #4**

The gage pressure of the oil in the hydraulic accumulator that powers the engine intake valve for cylinder #4.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64904                 |                                       |

**SPN 3628      Engine Intake Valve Actuation Oil Pressure for Cylinder #5**

The gage pressure of the oil in the hydraulic accumulator that powers the engine intake valve for cylinder #5.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64903                 |                                       |

**SPN 3629      Engine Intake Valve Actuation Oil Pressure for Cylinder #6**

The gage pressure of the oil in the hydraulic accumulator that powers the engine intake valve for cylinder #6.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64903                 |                                       |

**SPN 3630      Engine Intake Valve Actuation Oil Pressure for Cylinder #7**

The gage pressure of the oil in the hydraulic accumulator that powers the engine intake valve for cylinder #7.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64903                 |                                       |

**SPN 3631      Engine Intake Valve Actuation Oil Pressure for Cylinder #8**

The gage pressure of the oil in the hydraulic accumulator that powers the engine intake valve for cylinder #8.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64903                 |                                       |

**SPN 3632      Engine Intake Valve Actuation Oil Pressure for Cylinder #9**

The gage pressure of the oil in the hydraulic accumulator that powers the engine intake valve for cylinder #9.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64902                 |                                       |

**SPN 3633      Engine Intake Valve Actuation Oil Pressure for Cylinder #10**

The gage pressure of the oil in the hydraulic accumulator that powers the engine intake valve for cylinder #10.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64902                 |                                       |

**SPN 3634      Engine Intake Valve Actuation Oil Pressure for Cylinder #11**

The gage pressure of the oil in the hydraulic accumulator that powers the engine intake valve for cylinder #11.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64902                 |                                       |

**SPN 3635      Engine Intake Valve Actuation Oil Pressure for Cylinder #12**

The gage pressure of the oil in the hydraulic accumulator that powers the engine intake valve for cylinder #12.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64902                 |                                       |

**SPN 3636      Engine Intake Valve Actuation Oil Pressure for Cylinder #13**

The gage pressure of the oil in the hydraulic accumulator that powers the engine intake valve for cylinder #13.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64901                 |                                       |

**SPN 3637      Engine Intake Valve Actuation Oil Pressure for Cylinder #14**

The gage pressure of the oil in the hydraulic accumulator that powers the engine intake valve for cylinder #14.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64901                 |                                       |

**SPN 3638      Engine Intake Valve Actuation Oil Pressure for Cylinder #15**

The gage pressure of the oil in the hydraulic accumulator that powers the engine intake valve for cylinder #15.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64901                 |                                       |

**SPN 3639      Engine Intake Valve Actuation Oil Pressure for Cylinder #16**

The gage pressure of the oil in the hydraulic accumulator that powers the engine intake valve for cylinder #16.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64901                 |                                       |

**SPN 3640      Engine Intake Valve Actuation Oil Pressure for Cylinder #17**

The gage pressure of the oil in the hydraulic accumulator that powers the engine intake valve for cylinder #17.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64900                 |                                       |

**SPN 3641      Engine Intake Valve Actuation Oil Pressure for Cylinder #18**

The gage pressure of the oil in the hydraulic accumulator that powers the engine intake valve for cylinder #18.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64900                 |                                       |

**SPN 3642      Engine Intake Valve Actuation Oil Pressure for Cylinder #19**

The gage pressure of the oil in the hydraulic accumulator that powers the engine intake valve for cylinder #19.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64900                 |                                       |

**SPN 3643      Engine Intake Valve Actuation Oil Pressure for Cylinder #20**

The gage pressure of the oil in the hydraulic accumulator that powers the engine intake valve for cylinder #20.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64900                 |                                       |

**SPN 3644      Engine Derate Request**

This parameter is a derate request made from the engine control system to an external system, where the engine is requesting an external device to reduce the load being applied. A zero value indicates that there is no derate being requested and 100% means full derate being requested. Any non-zero value represents a derate is being requested, at a percentage of full load. The engine control system identifies any problems and determines the amount of derate the situation calls for. This parameter can be useful to customer applications that prefer awareness and control of the engine derate.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Status              |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64914               |                                       |



**SPN 3645      *Transfer case status***

This parameter describes the feedback from the transfer case controller . Used by instrument clusters, tachographs, PTOs , etc.

000 2 wheel high (normal or ``On Highway' Range)  
001 4 wheel high (normal or 'On Highway' Range)  
010 neutral  
011 2 wheel low (or ``Off Highway' Range)  
100 4 wheel low (or ``Off Highway' Range)  
101 Transfer Case Shift in Progress or gear not confirmed  
110 error  
111 not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 3 bits                   |                                       |
| Resolution:             | 8 states/3 bit, 0 offset |                                       |
| Data Range:             | 0 to 7                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64899                    |                                       |

**SPN 3667      *Engine Air Shutoff Status***

State signal which indicates the actual measured position of the Air Shutoff.

00 - Air flow allowed to engine  
01 - Air flow restricted  
10 - Error  
11 - Not Available

Note: This parameter, in conjunction with SPN 2813 - "Engine Air Shutoff Command Status", is provided to allow an external system to annunciate and/or alarm on either an accidental air shutoff (shutoff detected but not commanded), or a failed air shutoff (shutoff commanded but not detected).

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65252                    |                                       |

**SPN 3668      *Engine Intercooler Coolant Level***

Ratio of volume of liquid found in an engine intercooler cooling system to total engine intercooler cooling system volume.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64938               |                                       |

**SPN 3669      *Engine Rotation Direction***

Direction of engine rotation, as reported by the engine. Direction convention as viewed by an observer standing at the rear of the engine, viewing the flywheel.

00 - CounterClockWise (CCW)

01 - ClockWise (CW)

10 - Reserved

11 - Not Available

Data Length:            2 bits

Resolution:            4 states/2 bit, 0 offset

Data Range:            0 to 3

Operational Range: same as data range

Type:                    Measured

Supporting Information:

PGN reference:        65214

**SPN 3670      *Maximum Crank Attempts per Start Attempt***

The number of cranking cycles that will be performed before ending the start attempt. This is intended to be used in conjunction with Crank Attempt Count on Present Start Attempt, in order to give a FMI 0 diagnostic on the latter.

Data Length:            1 byte

Resolution:            1 count/bit, 0 offset

Data Range:            0 to 250

Operational Range: same as data range

Type:                    Status

Supporting Information:

PGN reference:        64895

**SPN 3671      *Crank Attempt Count on Present Start Attempt***

Reports the number of cranking cycles undergone during the present start attempt.

Note: This is intended to be used in conjunction with Maximum Crank Attempts per Start Attempt, in order to give a FMI 0 diagnostic on this parameter when the count exceeds the maximum. When the engine is not in a start attempt, this parameter can either hold the last value or return a Not Available (0xFF).

Data Length:            1 byte

Resolution:            1 count/bit, 0 offset

Data Range:            0 to 250

Operational Range: same as data range

Type:                    Status

Supporting Information:

PGN reference:        65214

**(R) SPN 3672      EGR1 Cooler Bypass Actuator Position**

The parameter gives the % open of the EGR Cooler Bypass Actuator, where 0% = Fully Closed (no gas flowing through the bypass), and 100% = Fully Open.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64897               |                                       |

**(R) SPN 3673      Engine Throttle Valve 2 Position**

The sensed position feedback of the valve, coming from a second electrical actuator for a second throttle plate, used to regulate the supply of a fluid, usually air or fuel//air mixture. 0% represents no supply and 100% is full supply. SPN 51 is used for the first throttle position feedback.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65266               |                                       |

**(R) SPN 3675      Engine Turbocharger Compressor Bypass Actuator 1 Position**

Measures the position of the turbocharger compressor bypass actuator, where 0% represents bypass fully closed and 100% represents bypass fully open. Typically, the compressor bypass is used to lower the compressor outlet pressure and/or intake manifold pressure during situations where too much boost is being generated by the turbocharger. Typically, a compressor bypass will be plumbed from the compressor outlet or intake manifold back to the compressor intake, with the compressor bypass actuator and valve in place to regulate bypass flow.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64931               |                                       |

**SPN 3676      Engine Aftercooler Coolant Level**

Ratio of aftercooler coolant system volume of liquid to total cooling system volume. The engine aftercooler coolant level is for the low temperature (LT) cooling circuit used for the compressor outlet air or charge aftercooling.

SPN 111 "Coolant Level" is assumed to represent a high temperature (HT) cooling circuit used for cooling the engine and its various components.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64938               |                                       |

**SPN 3683      Steering Wheel Angle**

The main operator's steering wheel angle (on the steering column, not the actual wheel angle). The vehicle being steered to the left results in a positive steering wheel angle.

|                         |                                        |                                       |
|-------------------------|----------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                                |                                       |
| Resolution:             | 1/1024 rad per bit, -31.374 rad offset |                                       |
| Data Range:             | -31.374 to +31.374 rad                 | Operational Range: same as data range |
| Type:                   | Measured                               |                                       |
| Supporting Information: |                                        |                                       |
| PGN reference:          | 61469                                  |                                       |

**SPN 3684      Steering Wheel Angle Range Counter**

The signal indicates the number of steering wheel angle range overflows if the operating range of steering wheel is greater than the measuring range of sensor element. Positive values indicate left turns. If the steering wheel angle range is +/-180 degrees this signal is equivalent to a steering wheel turn counter.

|                         |                                |                                       |
|-------------------------|--------------------------------|---------------------------------------|
| Data Length:            | 6 bits                         |                                       |
| Resolution:             | 1 range/bit, -32 ranges offset |                                       |
| Data Range:             | -32 to 29 ranges               | Operational Range: same as data range |
| Type:                   | Measured                       |                                       |
| Supporting Information: |                                |                                       |
| PGN reference:          | 61469                          |                                       |

**SPN 3685      Steering Wheel Angle Range Counter Type**

The signal indicates whether the steering wheel angle sensor is capable of absolute measuring of the number of steering wheel angle ranges or not. Absolute measuring means that the steering wheel angle range counter signal indicates the real position of steering wheel at ignition on. Relative measuring means that the steering wheel angle range counter signal is zero at ignition on independent of the real position of steering wheel.

00 - relative number of counts  
01 - absolute number of counts  
10 - not defined  
11 - signal not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61469                    |                                       |

**SPN 3686      Steering Wheel Angle Range**

The signal indicates the range of the steering wheel angle the sensor element is capable to measure. The steering wheel angle signal ranges between the negative and the positive value of the steering wheel angle range.

For example, a steering angle sensor transmits +13.6 rad to indicate a range of +/- 13.6 rad.

|                         |                                        |                                     |
|-------------------------|----------------------------------------|-------------------------------------|
| Data Length:            | 2 bytes                                |                                     |
| Resolution:             | 1/1024 rad per bit, -31.374 rad offset |                                     |
| Data Range:             | -31.374 to +31.374 rad                 | Operational Range: 0 to +31.374 rad |
| Type:                   | Measured                               |                                     |
| Supporting Information: |                                        |                                     |
| PGN reference:          | 61469                                  |                                     |

**SPN 3687      Steering Angle Sensor Active Mode**

This signal indicates the operational mode of the steering angle sensor.

00 – Programming mode active  
01 – Normal mode active  
10 – Reserved  
11 – Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61469                    |                                       |

**SPN 3688      Steering Angle Sensor Calibrated**

This signal indicates the calibration status of the steering angle sensor.

00 – SAS not calibrated  
01 – SAS calibrated  
10 – Reserved  
11 – Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        61469

Operational Range: same as data range

**SPN 3689      Message Counter**

The message counter is to verify the signal path from the demanding device to the steering controller. The support of this parameter is mandatory.

Note: The initial value of the 4 bit message counter for the first message during a driving cycle is arbitrary. In every following message the counter is incremented by 1 (0 follows 15).

Data Length:            4 bits  
Resolution:            1 count/bit, 0 offset  
Data Range:            0 to 15  
Type:                    Status  
Supporting Information:  
PGN reference:        61469

Operational Range: same as data range

**SPN 3690      Message Checksum**

The message checksum is used to verify the signal path from the demanding device to the steering controller. The support of this parameter is mandatory if PGN 61469 is supported as there is no means to indicate “not available”.

The 4 bit checksum is the sum of the high nibble and the low nibble of the sum of the identifier, the first 7 data bytes and the 4 bit message counter. It is calculated as follows:

Checksum = (Byte1 + Byte2 + Byte3 + Byte4 + Byte5 + Byte6 + Byte7 + message counter&0x0F + message ID low byte + message ID mid low byte + message ID mid high byte + message ID high byte)  
Checksum = ((Checksum >> 4) + Checksum) & 0x0F

Data Length:            4 bits  
Resolution:            1 count/bit, 0 offset  
Data Range:            0 to 15  
Type:                    Status  
Supporting Information:  
PGN reference:        61469

Operational Range: same as data range

**SPN 3691      *Left Headlamp Dynamic Bending Light***

This parameter indicates whether the dynamic bending light of the left headlamp is working properly.

- 000 Dynamic bending light deactivated. There is no problem but for some reasons (e.g. daylight present) the bending light is deactivated.
- 001 Dynamic bending light is working properly. Normal operation mode. Bending light is working properly.
- 010 Dynamic bending light fail safe position. Bending light is damaged, current position does not affect oncoming traffic.
- 011 Dynamic bending light failure. Bending light does not work, current position may affect oncoming traffic.
- 100 – 110 Reserved
- 111 Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 3 bits                   |                                       |
| Resolution:             | 8 states/3 bit, 0 offset |                                       |
| Data Range:             | 0 to 7                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64894                    |                                       |

**SPN 3692      *Right Headlamp Dynamic Bending Light***

This parameter indicates whether the dynamic bending light of the left headlamp is working properly.

- 000 Dynamic bending light deactivated. There is no problem but for some reasons (e.g. daylight present) the bending light is deactivated.
- 001 Dynamic bending light is working properly. Normal operation mode. Bending light is working properly.
- 010 Dynamic bending light fail safe position. Bending light is damaged, current position does not affect oncoming traffic.
- 011 Dynamic bending light failure. Bending light does not work, current position may affect oncoming traffic.
- 100 – 110 Reserved
- 111 Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 3 bits                   |                                       |
| Resolution:             | 8 states/3 bit, 0 offset |                                       |
| Data Range:             | 0 to 7                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64894                    |                                       |

**SPN 3693      *Left Headlamp Light Distribution***

This parameter indicates what kind of light distribution is set by the AFS system for the left headlamp.

- 0000 Light distribution town - The basic light distribution for town light is generated with a symmetrical cut-off line (Class V)
- 0001 Light distribution country - Country light is mostly similar to the actual SAE low beam pattern. (Class C)
- 0010 Light distribution motorway - The task of motorway light is an improved overall viewing distance and an optimum of illumination of the second lane on roads with more than one lane and without oncoming traffic. (Class E)
- 0011 Light distribution high beam - The high beam distribution of the module generates an illumination level that an additional high beam spot is not necessary.
- 0100 Light distribution adverse weather - The adverse weather light improves the viewing situation for the driver on wet roads and reduces the amount of glare from reflections on wet roads for the oncoming traffic. (Class W)
- 0101 Light distribution fail safe position - Module is damaged, current light distribution does not affect oncoming traffic.
- 0110 Light distribution failure - Module is damaged, current position may affect oncoming traffic.
- 0111 Different light distributions not available - No AFS distributions available. Head lamp has only one distribution.
- 1000 – 1110 Reserved
- 1111 Not available

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64894                     |                                       |

**SPN 3694      *Right Headlamp Light Distribution***

This parameter indicates what kind of light distribution is set by the AFS system for the right headlamp.

- 0000 Light distribution town - The basic light distribution for town light is generated with a symmetrical cut-off line (Class V)
- 0001 Light distribution country - Country light is mostly similar to the actual SAE low beam pattern. (Class C)
- 0010 Light distribution motorway - The task of motorway light is an improved overall viewing distance and an optimum of illumination of the second lane on roads with more than one lane and without oncoming traffic. (Class E)
- 0011 Light distribution high beam - The high beam distribution of the module generates an illumination level that an additional high beam spot is not necessary.
- 0100 Light distribution adverse weather - The adverse weather light improves the viewing situation for the driver on wet roads and reduces the amount of glare from reflections on wet roads for the oncoming traffic. (Class W)
- 0101 Light distribution fail safe position - Module is damaged, current light distribution does not affect oncoming traffic.
- 0110 Light distribution failure - Module is damaged, current position may affect oncoming traffic.
- 0111 Different light distributions not available - No AFS distributions available. Head lamp has only one distribution.
- 1000 – 1110 Reserved
- 1111 Not available

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64894                     |                                       |



**SPN 3695      Diesel Particulate Filter Regeneration Inhibit Switch**

Indicates the state of a switch available to the operator that inhibits diesel particulate filter regeneration.

00 not active  
01 active  
10 error  
11 not available

This SPN would be “not active” when diesel particulate filter regeneration is allowed to occur normally (diesel particulate filter regeneration is not inhibited).

The engine controller shall inhibit regeneration when SPN 3695 is in the ON state. Regeneration shall be activated by SPN 3696 when it is in the ON state and SPN 3695 is in the OFF state.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 57344                    |                                       |

**SPN 3696      Diesel Particulate Filter Regeneration Force Switch**

Indicates the state of a switch available to the operator that forces diesel particulate filter regeneration.

00 not active  
01 active  
10 error  
11 not available

This SPN would be “not active” when diesel particulate filter regeneration is allowed to occur normally (diesel particulate filter regeneration is not being forced).

The engine controller shall inhibit regeneration when SPN 3695 is in the ON state. Regeneration shall be activated by SPN 3696 when it is in the ON state and SPN 3695 is in the OFF state.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 57344                    |                                       |

**SPN 3697 Diesel Particulate Filter Lamp Command**

Command to control the diesel particulate filter lamp.

000 Off  
001 On – solid  
010 reserved for SAE assignment  
011 reserved for SAE assignment  
100 On – fast blink (1 HZ)  
101 reserved for SAE assignment  
110 reserved for SAE assignment  
111 not available

This SPN would be “off” when diesel particulate filter lamp is unlit. The “on - solid” should indicate that diesel particulate filter active regeneration is needed at the lowest level of urgency and that operator intervention is required. The flashing state indicates a more severe condition requiring regeneration.

This SPN shall not be used to convey information regarding operator switch feedback from SPNs 3695 and 3696.

The ISO 2575 Symbol F21 is recommended for use with this message.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 3 bits                    |                                       |
| Resolution:             | 8 states/3 bit, 0 offset  |                                       |
| Data Range:             | 0 to 7                    | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: | See Appendix D - SPN 3697 |                                       |
| PGN reference:          | 64892                     |                                       |

**SPN 3698 Exhaust System High Temperature Lamp Command**

Command to control the exhaust system high temperature lamp. This lamp indicates that the exhaust system temperature is high.

000 Off  
001 On – solid  
010 reserved for SAE assignment  
011 reserved for SAE assignment  
100 reserved for SAE assignment  
101 reserved for SAE assignment  
110 reserved for SAE assignment  
111 not available

This SPN would be “off” when the lamp is unlit. The “on - solid” status indicates that the exhaust gas temperature is high.

This SPN shall not be used to convey information regarding operator switch feedback from SPNs 3695 and 3696.

The ISO 2575 Symbol “to be assigned” is recommended for use with this message. This symbol is the ISO exhaust gas symbol with the temperature symbol added to it.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 3 bits                    |                                       |
| Resolution:             | 8 states/3 bit, 0 offset  |                                       |
| Data Range:             | 0 to 7                    | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: | See Appendix D - SPN 3697 |                                       |
| PGN reference:          | 64892                     |                                       |

**SPN 3699 Diesel Particulate Filter Passive Regeneration Status**

Indicates the state of diesel particulate filter passive regeneration.

00 not active  
01 active  
10 reserved for SAE assignment  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 64892

Operational Range: same as data range

**SPN 3700 Diesel Particulate Filter Active Regeneration Status**

Indicates the state of diesel particulate filter active regeneration.

00 not active  
01 active  
10 regeneration needed - automatically initiated active regeneration imminent  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information: See Appendix D - SPN 3697  
PGN reference: 64892

Operational Range: same as data range

**SPN 3701 Diesel Particulate Filter Status**

Indicates the state of the diesel particulate filter regeneration need and urgency.

000 Regeneration not needed  
001 Regeneration needed - lowest level  
010 Regeneration needed - moderate level  
011 Regeneration needed - highest level  
100 reserved for SAE assignment  
101 reserved for SAE assignment  
110 reserved for SAE assignment  
111 not available

Data Length: 3 bits  
Resolution: 8 states/3 bit, 0 offset  
Data Range: 0 to 7  
Type: Status  
Supporting Information: See Appendix D - SPN 3697  
PGN reference: 64892

Operational Range: same as data range

**SPN 3702      Diesel Particulate Filter Active Regeneration Inhibited Status**

Indicates the state of diesel particulate filter active regeneration inhibition.

00 not inhibited  
01 inhibited  
10 reserved for SAE assignment  
11 not available

This SPN indicates the reason for the diesel particulate filter regeneration not being initiated or being exited prior to completion. When this state becomes active, the system will not initiate an active regeneration or will exit an active regeneration. If the reason for inhibiting is not covered by SPNs 3703 thru 3717, a request should be submitted to the SAE Truck and Bus J1939 Request Processing Group to have the reason added.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64892                    |                                       |

**SPN 3703      Diesel Particulate Filter Active Regeneration Inhibited Due to Inhibit Switch**

Indicates the state of diesel particulate filter active regeneration inhibition due to the Diesel Particulate Filter Regeneration Inhibit Switch.

00 not inhibited  
01 inhibited  
10 reserved for SAE assignment  
11 not available

This SPN indicates the reason for the diesel particulate filter regeneration not being initiated or being exited prior to completion. When this state becomes active the system will not initiate an active regeneration or will exit an active regeneration. The state provides information that may be provided to the driver/service technician as to why the regeneration did not initiate or was exited.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 2 bits                    |                                       |
| Resolution:             | 4 states/2 bit, 0 offset  |                                       |
| Data Range:             | 0 to 3                    | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: | See Appendix D - SPN 3697 |                                       |
| PGN reference:          | 64892                     |                                       |

**SPN 3704      Diesel Particulate Filter Active Regeneration Inhibited Due to Clutch Disengaged**

Indicates the state of diesel particulate filter active regeneration inhibition due to the clutch being disengaged.

00 not inhibited  
01 inhibited  
10 reserved for SAE assignment  
11 not available

This SPN indicates the reason for the diesel particulate filter regeneration not being initiated or being exited prior to completion. When this state becomes active the system will not initiate an active regeneration or will exit an active regeneration. The state provides information that may be provided to the driver/service technician as to why the regeneration did not initiate or was exited.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64892                    |                                       |

**SPN 3705      Diesel Particulate Filter Active Regeneration Inhibited Due to Service Brake Active**

Indicates the state of diesel particulate filter active regeneration inhibition due to the service brake being active.

00 not inhibited  
01 inhibited  
10 reserved for SAE assignment  
11 not available

This SPN indicates the reason for the diesel particulate filter regeneration not being initiated or being exited prior to completion. When this state becomes active the system will not initiate an active regeneration or will exit an active regeneration. The state provides information that may be provided to the driver/service technician as to why the regeneration did not initiate or was exited.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64892                    |                                       |

**SPN 3706      Diesel Particulate Filter Active Regeneration Inhibited Due to PTO Active**

Indicates the state of diesel particulate filter active regeneration inhibition due to the PTO being active.

00 not inhibited  
01 inhibited  
10 reserved for SAE assignment  
11 not available

This SPN indicates the reason for the diesel particulate filter regeneration not being initiated or being exited prior to completion. When this state becomes active the system will not initiate an active regeneration or will exit an active regeneration. The state provides information that may be provided to the driver/service technician as to why the regeneration did not initiate or was exited.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64892                    |                                       |

**SPN 3707      Diesel Particulate Filter Active Regeneration Inhibited Due to Accelerator Pedal Off Idle**

Indicates the state of diesel particulate filter active regeneration inhibition due to the accelerator pedal being off idle.

00 not inhibited  
01 inhibited  
10 reserved for SAE assignment  
11 not available

This SPN indicates the reason for the diesel particulate filter regeneration not being initiated or being exited prior to completion. When this state becomes active the system will not initiate an active regeneration or will exit an active regeneration. The state provides information that may be provided to the driver/service technician as to why the regeneration did not initiate or was exited.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64892                    |                                       |

**SPN 3708      Diesel Particulate Filter Active Regeneration Inhibited Due to Out of Neutral**

Indicates the state of diesel particulate filter active regeneration inhibition due to the transmission being out of neutral.

00 not inhibited  
01 inhibited  
10 reserved for SAE assignment  
11 not available

This SPN indicates the reason for the diesel particulate filter regeneration not being initiated or being exited prior to completion. When this state becomes active the system will not initiate an active regeneration or will exit an active regeneration. The state provides information that may be provided to the driver/service technician as to why the regeneration did not initiate or was exited.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64892                    |                                       |

**SPN 3709      Diesel Particulate Filter Active Regeneration Inhibited Due to Vehicle Speed Above Allowed Speed**

Indicates the state of diesel particulate filter active regeneration inhibition due to the vehicle speed being above an allowed limit.

00 not inhibited  
01 inhibited  
10 reserved for SAE assignment  
11 not available

This SPN indicates the reason for the diesel particulate filter regeneration not being initiated or being exited prior to completion. When this state becomes active the system will not initiate an active regeneration or will exit an active regeneration. The state provides information that may be provided to the driver/service technician as to why the regeneration did not initiate or was exited.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64892                    |                                       |

**SPN 3710 Diesel Particulate Filter Active Regeneration Inhibited Due to Parking Brake Not Set**

Indicates the state of diesel particulate filter active regeneration inhibition due to the parking brake being not set.

00 not inhibited  
01 inhibited  
10 reserved for SAE assignment  
11 not available

This SPN indicates the reason for the diesel particulate filter regeneration not being initiated or being exited prior to completion. When this state becomes active the system will not initiate an active regeneration or will exit an active regeneration. The state provides information that may be provided to the driver/service technician as to why the regeneration did not initiate or was exited.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64892                    |                                       |

**SPN 3711 Diesel Particulate Filter Active Regeneration Inhibited Due to Low Exhaust Gas Temperature**

Indicates the state of diesel particulate filter active regeneration inhibition due to the exhaust gas temperature being too low. This implies that the diesel particulate filter and/or oxidation catalyst are likewise too cold for active regeneration.

00 not inhibited  
01 inhibited  
10 reserved for SAE assignment  
11 not available

This SPN indicates the reason for the diesel particulate filter regeneration not being initiated or being exited prior to completion. When this state becomes active the system will not initiate an active regeneration or will exit an active regeneration. The state provides information that may be provided to the driver/service technician as to why the regeneration did not initiate or was exited.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64892                    |                                       |



**SPN 3712      Diesel Particulate Filter Active Regeneration Inhibited Due to System Fault Active**

Indicates the state of diesel particulate filter active regeneration inhibition due to a system fault being active.

00 not inhibited  
01 inhibited  
10 reserved for SAE assignment  
11 not available

This SPN indicates the reason for the diesel particulate filter regeneration not being initiated or being exited prior to completion. When this state becomes active the system will not initiate an active regeneration or will exit an active regeneration. The state provides information that may be provided to the driver/service technician as to why the regeneration did not initiate or was exited.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64892                    |                                       |

**SPN 3713      Diesel Particulate Filter Active Regeneration Inhibited Due to System Timeout**

Indicates the state of diesel particulate filter active regeneration inhibition due to a system timeout.

00 not inhibited  
01 inhibited  
10 reserved for SAE assignment  
11 not available

This SPN indicates the reason for the diesel particulate filter regeneration not being initiated or being exited prior to completion. When this state becomes active the system will not initiate an active regeneration or will exit an active regeneration. The state provides information that may be provided to the driver/service technician as to why the regeneration did not initiate or was exited.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64892                    |                                       |

**SPN 3714      Diesel Particulate Filter Active Regeneration Inhibited Due to Temporary System Lockout**

Indicates the state of diesel particulate filter active regeneration inhibition due to a temporary system lockout.

00 not inhibited  
01 inhibited  
10 reserved for SAE assignment  
11 not available

This SPN indicates the reason for the diesel particulate filter regeneration not being initiated or being exited prior to completion. When this state becomes active the system will not initiate an active regeneration or will exit an active regeneration. The state provides information that may be provided to the driver/service technician as to why the regeneration did not initiate or was exited.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64892                    |                                       |

**SPN 3715      Diesel Particulate Filter Active Regeneration Inhibited Due to Permanent System Lockout**

Indicates the state of diesel particulate filter active regeneration inhibition due to a permanent system lockout.

00 not inhibited  
01 inhibited  
10 reserved for SAE assignment  
11 not available

This SPN indicates the reason for the diesel particulate filter regeneration not being initiated or being exited prior to completion. When this state becomes active the system will not initiate an active regeneration or will exit an active regeneration. The state provides information that may be provided to the driver/service technician as to why the regeneration did not initiate or was exited.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64892                    |                                       |

**SPN 3716      Diesel Particulate Filter Active Regeneration Inhibited Due to Engine Not Warmed Up**

Indicates the state of diesel particulate filter active regeneration inhibition due to the engine not being warmed up.

00 not inhibited  
01 inhibited  
10 reserved for SAE assignment  
11 not available

This SPN indicates the reason for the diesel particulate filter regeneration not being initiated or being exited prior to completion. When this state becomes active the system will not initiate an active regeneration or will exit an active regeneration. The state provides information that may be provided to the driver/service technician as to why the regeneration did not initiate or was exited.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64892                    |                                       |

**SPN 3717      Diesel Particulate Filter Active Regeneration Inhibited Due to Vehicle Speed Below Allowed Speed**

Indicates the state of diesel particulate filter active regeneration inhibition due to vehicle speed being less than the allowed vehicle speed.

00 not inhibited  
01 inhibited  
10 reserved for SAE assignment  
11 not available

This SPN indicates the reason for the diesel particulate filter regeneration not being initiated or being exited prior to completion. When this state becomes active the system will not initiate an active regeneration or will exit an active regeneration. The state provides information that may be provided to the driver/service technician as to why the regeneration did not initiate or was exited.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64892                    |                                       |

**SPN 3718 Diesel Particulate Filter Automatic Active Regeneration Initiation Configuration**

Indicates the configuration of diesel particulate filter active regeneration automatic initiation.

00 not enabled

01 enabled

10 reserved for SAE assignment

11 not available

Data Length: 2 bits

Resolution: 4 states/2 bit, 0 offset

Data Range: 0 to 3

Type: Status

Supporting Information:

PGN reference: 64892

Operational Range: same as data range

**SPN 3719 Diesel Particulate Filter 1 Soot Load Percent**

Indicates the soot load percent of diesel particulate filter 1. 100% is the level at which active diesel particulate filter regeneration should be triggered.

100% level is the active regeneration trigger level (and if conditions are not favorable for regeneration, soot loading can continue beyond 100%). During normal operation and regeneration a value 0% will indicate a fully regenerated diesel particulate filter. Values of 25%, 50% and 75% will indicate the general level of soot prior to the 100% level where an active regeneration is needed.

Data Length: 1 byte

Resolution: 1 %/bit, 0 offset

Data Range: 0 to 250 %

Type: Measured

Supporting Information:

PGN reference: 64891

Operational Range: same as data range

**SPN 3720 Diesel Particulate Filter 1 Ash Load Percent**

Indicates the ash load percent of diesel particulate filter 1. 100% is the level at which diesel particulate filter ash service should be performed.

100% level is the target ash service interval (and if ash service is not immediately performed, ash loading can continue beyond 100%).

Data Length: 1 byte

Resolution: 1 %/bit, 0 offset

Data Range: 0 to 250 %

Type: Measured

Supporting Information:

PGN reference: 64891

Operational Range: same as data range

**SPN 3721 Diesel Particulate Filter 1 Time Since Last Active Regeneration**

Indicates the time since the last active regeneration event of diesel particulate filter 1.

Data Length: 4 bytes  
Resolution: 1 s/bit, 0 offset  
Data Range: 0 to 4,211,081,215 s  
Type: Measured  
Supporting Information:  
PGN reference: 64891

Operational Range: same as data range

**SPN 3722 Diesel Particulate Filter 2 Soot Load Percent**

Indicates the soot load percent of diesel particulate filter 2. 100% is the level at which active diesel particulate filter regeneration should be triggered.

100% level is the active regeneration trigger level (and if conditions are not favorable for regeneration, soot loading can continue beyond 100%). During normal operation and regeneration a value 0% will indicate a fully regenerated diesel particulate filter. Values of 25%, 50% and 75% will indicate the general level of soot prior to the 100% level where an active regeneration is needed.

Data Length: 1 byte  
Resolution: 1 %/bit, 0 offset  
Data Range: 0 to 250 %  
Type: Measured  
Supporting Information:  
PGN reference: 64890

Operational Range: same as data range

**SPN 3723 Diesel Particulate Filter 2 Ash Load Percent**

Indicates the ash load percent of diesel particulate filter 2. 100% is the level at which diesel particulate filter ash service should be performed.

100% level is the target ash service interval (and if ash service is not immediately performed, ash loading can continue beyond 100%).

Data Length: 1 byte  
Resolution: 1 %/bit, 0 offset  
Data Range: 0 to 250 %  
Type: Measured  
Supporting Information:  
PGN reference: 64890

Operational Range: same as data range

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**SPN 3724      Diesel Particulate Filter 2 Time Since Last Active Regeneration**

Indicates the time since the last active regeneration event of diesel particulate filter 2.

Data Length: 4 bytes  
Resolution: 1 s/bit, 0 offset  
Data Range: 0 to 4,211,081,215 s  
Type: Measured  
Supporting Information:  
PGN reference: 64890

Operational Range: same as data range

**SPN 3725      Aftertreatment 1 Total Passive Regeneration Time**

Total amount of time that aftertreatment device 1 has been in passive regeneration over the lifetime of the device.

Data Length: 4 bytes  
Resolution: 1 s/bit, 0 offset  
Data Range: 0 to 4,211,081,215 s  
Type: Measured  
Supporting Information:  
PGN reference: 64920

Operational Range: same as data range

**SPN 3726      Aftertreatment 1 Total Number of Passive Regenerations**

Total number of passive regenerations by aftertreatment device 1 over the lifetime of the device.

Data Length: 4 bytes  
Resolution: 1 count/bit, 0 offset  
Data Range: 0 to 4,294,967,295 counts  
Type: Measured  
Supporting Information:  
PGN reference: 64920

Operational Range: same as data range

**SPN 3727      Aftertreatment 1 Total Number of Active Regeneration Inhibit Requests**

Total number of aftertreatment device 1 active regeneration inhibit requests by the operator over the lifetime of the device.

Data Length: 4 bytes  
Resolution: 1 count/bit, 0 offset  
Data Range: 0 to 4,294,967,295 counts  
Type: Measured  
Supporting Information:  
PGN reference: 64920

Operational Range: same as data range

**SPN 3728      *Aftertreatment 1 Total Number of Active Regeneration Manual Requests***

Total number of aftertreatment device 1 active regeneration manual requests by the operator over the lifetime of the device.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bytes                   |                                       |
| Resolution:             | 1 count/bit, 0 offset     |                                       |
| Data Range:             | 0 to 4,294,967,295 counts | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64920                     |                                       |

**SPN 3729      *Aftertreatment 2 Total Passive Regeneration Time***

Total amount of time that Aftertreatment device 2 has been in passive regeneration over the lifetime of the device.

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 4 bytes              |                                       |
| Resolution:             | 1 s/bit, 0 offset    |                                       |
| Data Range:             | 0 to 4,211,081,215 s | Operational Range: same as data range |
| Type:                   | Measured             |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 64921                |                                       |

**SPN 3730      *Aftertreatment 2 Total Number of Passive Regenerations***

Total number of passive regenerations by Aftertreatment device 2 over the lifetime of the device.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bytes                   |                                       |
| Resolution:             | 1 count/bit, 0 offset     |                                       |
| Data Range:             | 0 to 4,294,967,295 counts | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64921                     |                                       |

**SPN 3731      *Aftertreatment 2 Total Number of Active Regeneration Inhibit Requests***

Total number of Aftertreatment device 2 active regeneration inhibit requests by the operator over the lifetime of the device.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bytes                   |                                       |
| Resolution:             | 1 count/bit, 0 offset     |                                       |
| Data Range:             | 0 to 4,294,967,295 counts | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64921                     |                                       |

**SPN 3732      *Aftertreatment 2 Total Number of Active Regeneration Manual Requests***

Total number of Aftertreatment device 2 active regeneration manual requests by the operator over the lifetime of the device.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bytes                   |                                       |
| Resolution:             | 1 count/bit, 0 offset     |                                       |
| Data Range:             | 0 to 4,294,967,295 counts | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64921                     |                                       |

**SPN 3733      *Aftertreatment 1 Trip Fuel Used***

Total amount of fuel used by aftertreatment device 1 during the current trip period.

NOTE: This SPN needs to be reset by the reset PGN 56832.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.5 L/bit, 0 offset    |                                       |
| Data Range:             | 0 to 2,105,540,607.5 L | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 64889                  |                                       |

**SPN 3734      *Aftertreatment 1 Trip Active Regeneration Time***

Total amount of time that aftertreatment device 1 has been in active regeneration during the current trip period.

NOTE: This SPN needs to be reset by the reset PGN 56832.

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 4 bytes              |                                       |
| Resolution:             | 1 s/bit, 0 offset    |                                       |
| Data Range:             | 0 to 4,211,081,215 s | Operational Range: same as data range |
| Type:                   | Measured             |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 64889                |                                       |

**SPN 3735      *Aftertreatment 1 Trip Disabled Time***

Total amount of time that aftertreatment 1 regeneration has been manually disabled during the current trip period.

NOTE: This SPN needs to be reset by the reset PGN 56832.

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 4 bytes              |                                       |
| Resolution:             | 1 s/bit, 0 offset    |                                       |
| Data Range:             | 0 to 4,211,081,215 s | Operational Range: same as data range |
| Type:                   | Measured             |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 64889                |                                       |



**SPN 3736      *Aftertreatment 1 Trip Number of Active Regenerations***

Total number of active regenerations by Aftertreatment device 1 during the current trip period.

NOTE: This SPN needs to be reset by the reset PGN 56832.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bytes                   |                                       |
| Resolution:             | 1 count/bit, 0 offset     |                                       |
| Data Range:             | 0 to 4,294,967,295 counts | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64889                     |                                       |

**SPN 3737      *Aftertreatment 1 Trip Passive Regeneration Time***

Total amount of time that aftertreatment device 1 has been in passive regeneration during the current trip period.

NOTE: This SPN needs to be reset by the reset PGN 56832.

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 4 bytes              |                                       |
| Resolution:             | 1 s/bit, 0 offset    |                                       |
| Data Range:             | 0 to 4,211,081,215 s | Operational Range: same as data range |
| Type:                   | Measured             |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 64889                |                                       |

**SPN 3738      *Aftertreatment 1 Trip Number of Passive Regenerations***

Total number of passive regenerations by Aftertreatment device 1 during the current trip period.

NOTE: This SPN needs to be reset by the reset PGN 56832.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bytes                   |                                       |
| Resolution:             | 1 count/bit, 0 offset     |                                       |
| Data Range:             | 0 to 4,294,967,295 counts | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64889                     |                                       |

**SPN 3739      *Aftertreatment 1 Trip Number of Active Regeneration Inhibit Requests***

Total number of aftertreatment device 1 active regeneration inhibit requests by the operator during the current trip period.

NOTE: This SPN needs to be reset by the reset PGN 56832.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bytes                   |                                       |
| Resolution:             | 1 count/bit, 0 offset     |                                       |
| Data Range:             | 0 to 4,294,967,295 counts | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64889                     |                                       |

**SPN 3740      *Aftertreatment 1 Trip Number of Active Regeneration Manual Requests***

Total number of Aftertreatment device 1 active regeneration manual requests by the operator during the current trip period.

NOTE: This SPN needs to be reset by the reset PGN 56832.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bytes                   |                                       |
| Resolution:             | 1 count/bit, 0 offset     |                                       |
| Data Range:             | 0 to 4,294,967,295 counts | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64889                     |                                       |

**SPN 3741      *Aftertreatment 2 Trip Fuel Used***

Total amount of fuel used by aftertreatment device 2 during the current trip period.

NOTE: This SPN needs to be reset by the reset PGN 56832.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 4 bytes                |                                       |
| Resolution:             | 0.5 L/bit, 0 offset    |                                       |
| Data Range:             | 0 to 2,105,540,607.5 L | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 64888                  |                                       |

**SPN 3742      *Aftertreatment 2 Trip Active Regeneration Time***

Total amount of time that aftertreatment device 2 has been in active regeneration during the current trip period.

NOTE: This SPN needs to be reset by the reset PGN 56832.

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 4 bytes              |                                       |
| Resolution:             | 1 s/bit, 0 offset    |                                       |
| Data Range:             | 0 to 4,211,081,215 s | Operational Range: same as data range |
| Type:                   | Measured             |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 64888                |                                       |

**SPN 3743      *Aftertreatment 2 Trip Disabled Time***

Total amount of time that aftertreatment 2 regeneration has been manually disabled during the current trip period.

NOTE: This SPN needs to be reset by the reset PGN 56832.

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 4 bytes              |                                       |
| Resolution:             | 1 s/bit, 0 offset    |                                       |
| Data Range:             | 0 to 4,211,081,215 s | Operational Range: same as data range |
| Type:                   | Measured             |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 64888                |                                       |

**SPN 3744      *Aftertreatment 2 Trip Number of Active Regenerations***

Total number of active regenerations by aftertreatment device 2 during the current trip period.

NOTE: This SPN needs to be reset by the reset PGN 56832.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bytes                   |                                       |
| Resolution:             | 1 count/bit, 0 offset     |                                       |
| Data Range:             | 0 to 4,294,967,295 counts | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64888                     |                                       |

**SPN 3745      *Aftertreatment 2 Trip Passive Regeneration Time***

Total amount of time that aftertreatment device 2 has been in passive regeneration during the current trip period.

NOTE: This SPN needs to be reset by the reset PGN 56832.

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 4 bytes              |                                       |
| Resolution:             | 1 s/bit, 0 offset    |                                       |
| Data Range:             | 0 to 4,211,081,215 s | Operational Range: same as data range |
| Type:                   | Measured             |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 64888                |                                       |

**SPN 3746      *Aftertreatment 2 Trip Number of Passive Regenerations***

Total number of passive regenerations by aftertreatment device 2 during the current trip period.

NOTE: This SPN needs to be reset by the reset PGN 56832.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bytes                   |                                       |
| Resolution:             | 1 count/bit, 0 offset     |                                       |
| Data Range:             | 0 to 4,294,967,295 counts | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64888                     |                                       |

**SPN 3747      *Aftertreatment 2 Trip Number of Active Regeneration Inhibit Requests***

Total number of aftertreatment device 2 active regeneration inhibit requests by the operator during the current trip period.

NOTE: This SPN needs to be reset by the reset PGN 56832.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bytes                   |                                       |
| Resolution:             | 1 count/bit, 0 offset     |                                       |
| Data Range:             | 0 to 4,294,967,295 counts | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64888                     |                                       |

**SPN 3748      *Aftertreatment 2 Trip Number of Active Regeneration Manual Requests***

Total number of aftertreatment device 2 active regeneration manual requests by the operator during the current trip period.

NOTE: This SPN needs to be reset by the reset PGN 56832.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bytes                   |                                       |
| Resolution:             | 1 count/bit, 0 offset     |                                       |
| Data Range:             | 0 to 4,294,967,295 counts | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64888                     |                                       |

**SPN 3785      *Tractor Brake Stroke Axle 1 Left***

Brake stroke status for left brake actuator on tractor axle 1.

000 - OK (Normal operation)  
001 - Non-functioning  
010 - Overstroke  
011 - Dragging brake  
100 - Reserved  
101 - Reserved  
110 - Sensor error  
111 - Not available

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 3 bits                    |                                       |
| Resolution:             | 8 states/3 bit, 0 offset  |                                       |
| Data Range:             | 0 to 7                    | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: | See Appendix D - SPN 3785 |                                       |
| PGN reference:          | 64881                     |                                       |

**SPN 3786      *Tractor Brake Stroke Axle 1 Right***

Brake stroke status for right brake actuator on tractor axle 1.

000 - OK (Normal operation)  
001 - Non-functioning  
010 - Overstroke  
011 - Dragging brake  
100 - Reserved  
101 - Reserved  
110 - Sensor error  
111 - Not available

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 3 bits                    |                                       |
| Resolution:             | 8 states/3 bit, 0 offset  |                                       |
| Data Range:             | 0 to 7                    | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: | See Appendix D - SPN 3785 |                                       |
| PGN reference:          | 64881                     |                                       |

**SPN 3787      *Tractor Brake Stroke Axle 2 Left***

Brake stroke status for left brake actuator on tractor axle 2.

000 - OK (Normal operation)  
001 - Non-functioning  
010 - Overstroke  
011 - Dragging brake  
100 - Reserved  
101 - Reserved  
110 - Sensor error  
111 - Not available

Data Length:            3 bits  
Resolution:            8 states/3 bit, 0 offset  
Data Range:            0 to 7  
Type:                    Status  
Supporting Information: See Appendix D - SPN 3785  
PGN reference:        64881

Operational Range: same as data range

**SPN 3788      *Tractor Brake Stroke Axle 2 Right***

Brake stroke status for right brake actuator on tractor axle 2.

000 - OK (Normal operation)  
001 - Non-functioning  
010 - Overstroke  
011 - Dragging brake  
100 - Reserved  
101 - Reserved  
110 - Sensor error  
111 - Not available

Data Length:            3 bits  
Resolution:            8 states/3 bit, 0 offset  
Data Range:            0 to 7  
Type:                    Status  
Supporting Information: See Appendix D - SPN 3785  
PGN reference:        64881

Operational Range: same as data range

**SPN 3789      Tractor Brake Stroke Axle 3 Left**

Brake stroke status for left brake actuator on tractor axle 3.

000 - OK (Normal operation)  
001 - Non-functioning  
010 - Overstroke  
011 - Dragging brake  
100 - Reserved  
101 - Reserved  
110 - Sensor error  
111 - Not available

Data Length:            3 bits  
Resolution:            8 states/3 bit, 0 offset  
Data Range:            0 to 7  
Type:                    Status  
Supporting Information: See Appendix D - SPN 3785  
PGN reference:        64881

Operational Range: same as data range

**SPN 3790      Tractor Brake Stroke Axle 3 Right**

Brake stroke status for right brake actuator on tractor axle 3.

000 - OK (Normal operation)  
001 - Non-functioning  
010 - Overstroke  
011 - Dragging brake  
100 - Reserved  
101 - Reserved  
110 - Sensor error  
111 - Not available

Data Length:            3 bits  
Resolution:            8 states/3 bit, 0 offset  
Data Range:            0 to 7  
Type:                    Status  
Supporting Information: See Appendix D - SPN 3785  
PGN reference:        64881

Operational Range: same as data range

**SPN 3791      Tractor Brake Stroke Axle 4 Left**

Brake stroke status for left brake actuator on tractor axle 4.

000 - OK (Normal operation)  
001 - Non-functioning  
010 - Overstroke  
011 - Dragging brake  
100 - Reserved  
101 - Reserved  
110 - Sensor error  
111 - Not available

Data Length:            3 bits  
Resolution:            8 states/3 bit, 0 offset  
Data Range:            0 to 7  
Type:                    Status  
Supporting Information: See Appendix D - SPN 3785  
PGN reference:        64881

Operational Range: same as data range

**SPN 3792      Tractor Brake Stroke Axle 4 Right**

Brake stroke status for right brake actuator on tractor axle 4.

000 - OK (Normal operation)  
001 - Non-functioning  
010 - Overstroke  
011 - Dragging brake  
100 - Reserved  
101 - Reserved  
110 - Sensor error  
111 - Not available

Data Length:            3 bits  
Resolution:            8 states/3 bit, 0 offset  
Data Range:            0 to 7  
Type:                    Status  
Supporting Information: See Appendix D - SPN 3785  
PGN reference:        64881

Operational Range: same as data range

**SPN 3793      Tractor Brake Stroke Axle 5 Left**

Brake stroke status for left brake actuator on tractor axle 5.

000 - OK (Normal operation)  
001 - Non-functioning  
010 - Overstroke  
011 - Dragging brake  
100 - Reserved  
101 - Reserved  
110 - Sensor error  
111 - Not available

Data Length:            3 bits  
Resolution:            8 states/3 bit, 0 offset  
Data Range:            0 to 7  
Type:                    Status  
Supporting Information: See Appendix D - SPN 3785  
PGN reference:        64881

Operational Range: same as data range

**SPN 3794      Tractor Brake Stroke Axle 5 Right**

Brake stroke status for right brake actuator on tractor axle 5.

000 - OK (Normal operation)  
001 - Non-functioning  
010 - Overstroke  
011 - Dragging brake  
100 - Reserved  
101 - Reserved  
110 - Sensor error  
111 - Not available

Data Length:            3 bits  
Resolution:            8 states/3 bit, 0 offset  
Data Range:            0 to 7  
Type:                    Status  
Supporting Information: See Appendix D - SPN 3785  
PGN reference:        64881

Operational Range: same as data range



**SPN 3795      Trailer Brake Stroke Axle 1 Left**

Brake stroke status for left brake actuator on trailerr axle 1.

000 - OK (Normal operation)  
001 - Non-functioning  
010 - Overstroke  
011 - Dragging brake  
100 - Reserved  
101 - Reserved  
110 - Sensor error  
111 - Not available

Data Length:            3 bits  
Resolution:            8 states/3 bit, 0 offset  
Data Range:            0 to 7  
Type:                    Status  
Supporting Information: See Appendix D - SPN 3785  
PGN reference:        64881

Operational Range: same as data range

**SPN 3796      Trailer Brake Stroke Axle 1 Right**

Brake stroke status for right brake actuator on trailer axle 1.

000 - OK (Normal operation)  
001 - Non-functioning  
010 - Overstroke  
011 - Dragging brake  
100 - Reserved  
101 - Reserved  
110 - Sensor error  
111 - Not available

Data Length:            3 bits  
Resolution:            8 states/3 bit, 0 offset  
Data Range:            0 to 7  
Type:                    Status  
Supporting Information: See Appendix D - SPN 3785  
PGN reference:        64881

Operational Range: same as data range

**SPN 3797      Trailer Brake Stroke Axle 2 Left**

Brake stroke status for left brake actuator on trailer axle 2.

000 - OK (Normal operation)  
001 - Non-functioning  
010 - Overstroke  
011 - Dragging brake  
100 - Reserved  
101 - Reserved  
110 - Sensor error  
111 - Not available

Data Length:            3 bits  
Resolution:            8 states/3 bit, 0 offset  
Data Range:            0 to 7  
Type:                    Status  
Supporting Information: See Appendix D - SPN 3785  
PGN reference:        64881

Operational Range: same as data range

**SPN 3798      Trailer Brake Stroke Axle 2 Right**

Brake stroke status for right brake actuator on trailer axle 2.

000 - OK (Normal operation)  
001 - Non-functioning  
010 - Overstroke  
011 - Dragging brake  
100 - Reserved  
101 - Reserved  
110 - Sensor error  
111 - Not available

Data Length:            3 bits  
Resolution:            8 states/3 bit, 0 offset  
Data Range:            0 to 7  
Type:                    Status  
Supporting Information: See Appendix D - SPN 3785  
PGN reference:        64881

Operational Range: same as data range

**SPN 3799      Trailer Brake Stroke Axle 3 Left**

Brake stroke status for left brake actuator on trailer axle 3.

000 - OK (Normal operation)  
001 - Non-functioning  
010 - Overstroke  
011 - Dragging brake  
100 - Reserved  
101 - Reserved  
110 - Sensor error  
111 - Not available

Data Length:            3 bits  
Resolution:            8 states/3 bit, 0 offset  
Data Range:            0 to 7  
Type:                    Status  
Supporting Information: See Appendix D - SPN 3785  
PGN reference:        64881

Operational Range: same as data range

**SPN 3800      Trailer Brake Stroke Axle 3 Right**

Brake stroke status for right brake actuator on trailer axle 3.

000 - OK (Normal operation)  
001 - Non-functioning  
010 - Overstroke  
011 - Dragging brake  
100 - Reserved  
101 - Reserved  
110 - Sensor error  
111 - Not available

Data Length:            3 bits  
Resolution:            8 states/3 bit, 0 offset  
Data Range:            0 to 7  
Type:                    Status  
Supporting Information: See Appendix D - SPN 3785  
PGN reference:        64881

Operational Range: same as data range

**SPN 3801      Trailer Brake Stroke Axle 4 Left**

Brake stroke status for left brake actuator on trailer axle 4.

000 - OK (Normal operation)  
001 - Non-functioning  
010 - Overstroke  
011 - Dragging brake  
100 - Reserved  
101 - Reserved  
110 - Sensor error  
111 - Not available

Data Length:            3 bits  
Resolution:            8 states/3 bit, 0 offset  
Data Range:            0 to 7  
Type:                    Status  
Supporting Information: See Appendix D - SPN 3785  
PGN reference:        64881

Operational Range: same as data range

**SPN 3802      Trailer Brake Stroke Axle 4 Right**

Brake stroke status for right brake actuator on trailer axle 4.

000 - OK (Normal operation)  
001 - Non-functioning  
010 - Overstroke  
011 - Dragging brake  
100 - Reserved  
101 - Reserved  
110 - Sensor error  
111 - Not available

Data Length:            3 bits  
Resolution:            8 states/3 bit, 0 offset  
Data Range:            0 to 7  
Type:                    Status  
Supporting Information: See Appendix D - SPN 3785  
PGN reference:        64881

Operational Range: same as data range

**SPN 3803      Trailer Brake Stroke Axle 5 Left**

Brake stroke status for left brake actuator on trailer axle 5.

000 - OK (Normal operation)  
001 - Non-functioning  
010 - Overstroke  
011 - Dragging brake  
100 - Reserved  
101 - Reserved  
110 - Sensor error  
111 - Not available

Data Length:            3 bits  
Resolution:            8 states/3 bit, 0 offset  
Data Range:            0 to 7  
Type:                    Status  
Supporting Information: See Appendix D - SPN 3785  
PGN reference:        64881

Operational Range: same as data range

**SPN 3804      Trailer Brake Stroke Axle 5 Right**

Brake stroke status for right brake actuator on trailer axle 5.

000 - OK (Normal operation)  
001 - Non-functioning  
010 - Overstroke  
011 - Dragging brake  
100 - Reserved  
101 - Reserved  
110 - Sensor error  
111 - Not available

Data Length:            3 bits  
Resolution:            8 states/3 bit, 0 offset  
Data Range:            0 to 7  
Type:                    Status  
Supporting Information: See Appendix D - SPN 3785  
PGN reference:        64881

Operational Range: same as data range

**SPN 3807      *Park Brake Release Inhibit Request***

Park Brake Release Inhibit Request signals the desire that an applied park brake remain applied and limit the ability of the vehicle to be moved.

00 - Park Brake Release Inhibit not requested  
01 - Park Brake Release Inhibit requested  
10 - SAE reserved  
11 - Unavailable

This parameter provides the capability to request the device controlling a parking brake to inhibit its release. This is intended for devices to request the park brake remain applied. Status 00b is provided when conditions recommending the application of the park brake no longer exist for the sender.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65265                    |                                       |

**SPN 3808      *Park Brake Release Inhibit Status***

This parameter provides reports on the status of the Park Brake Release Inhibit function.

00 - Park Brake release is not inhibited  
01 - Park Brake release is inhibited  
10 - Error (for example: Park Brake release is not inhibited, but is requested to be inhibited)  
11 - Unavailable

The device controlling the Park Brake sends a status of the inhibit function. The allowed release of the park brake is provided as status 00b. 01b indicates that the release of the park brake is inhibited. The release may be inhibited by either an external request or by local information available to the controlling device.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65274                    |                                       |

**SPN 3809      *Transmission Oil Level Request***

Conveys operator or vehicle system desire for a transmission oil level reading to be taken.

00 - No transmission oil level reading desired  
01 - Transmission oil level reading desired  
10 - Reserved  
11 - Don't care / take no action

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64980

Operational Range: same as data range

**SPN 3810      *Retract Status of ramp 1***

Retract status of ramp at doorway 1, counting from front to back on the vehicle.

00 ramp retracted  
01 ramp extended  
10 error  
11 not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64880

Operational Range: same as data range

**SPN 3811      *Enable status of ramp 1***

Enable status of ramp at doorway 1, counting from front to back on the vehicle.

00 ramp disabled  
01 ramp enabled  
10 error  
11 not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64880

Operational Range: same as data range

**SPN 3812                    *Movement status of ramp 1***

Movement status of ramp at doorway 1, counting from front to back on the vehicle.

00 ramp not being moved  
01 ramp being moved  
10 error  
11 not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64880

Operational Range: same as data range

**SPN 3813                    *Retract Status of ramp 2***

Retract status of ramp at doorway 2, counting from front to back on the vehicle.

00 ramp retracted  
01 ramp extended  
10 error  
11 not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64880

Operational Range: same as data range

**SPN 3814                    *Enable status of ramp 2***

Enable status of ramp at doorway 2, counting from front to back on the vehicle.

00 ramp disabled  
01 ramp enabled  
10 error  
11 not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64880

Operational Range: same as data range



**SPN 3815                      Movement status of ramp 2**

Movement status of ramp at doorway 2, counting from front to back on the vehicle.

00 ramp not being moved  
01 ramp being moved  
10 error  
11 not available

Data Length:                2 bits  
Resolution:                4 states/2 bit, 0 offset  
Data Range:                0 to 3  
Type:                        Status  
Supporting Information:  
PGN reference:              64880

Operational Range: same as data range

**SPN 3816                      Retract Status of ramp 3**

Retract status of ramp at doorway 3, counting from front to back on the vehicle.

00 ramp retracted  
01 ramp extended  
10 error  
11 not available

Data Length:                2 bits  
Resolution:                4 states/2 bit, 0 offset  
Data Range:                0 to 3  
Type:                        Status  
Supporting Information:  
PGN reference:              64880

Operational Range: same as data range

**SPN 3817                      Enable status of ramp 3**

Enable status of ramp at doorway 3, counting from front to back on the vehicle.

00 ramp disabled  
01 ramp enabled  
10 error  
11 not available

Data Length:                2 bits  
Resolution:                4 states/2 bit, 0 offset  
Data Range:                0 to 3  
Type:                        Status  
Supporting Information:  
PGN reference:              64880

Operational Range: same as data range

**SPN 3818                    *Movement status of ramp 3***

Movement status of ramp at doorway 3, counting from front to back on the vehicle.

00 ramp not being moved

01 ramp being moved

10 error

11 not available

Data Length:                2 bits

Resolution:                4 states/2 bit, 0 offset

Data Range:                0 to 3

Type:                        Status

Supporting Information:

PGN reference:              64880

Operational Range: same as data range

**SPN 3819                    *Front axle group engagement status***

Front axle group engagement status

00 front axle group disengaged

01 front axle group engaged

10 error

11 not available

Data Length:                2 bits

Resolution:                4 states/2 bit, 0 offset

Data Range:                0 to 3

Type:                        Status

Supporting Information:

PGN reference:              61446

Operational Range: same as data range

**SPN 3820                    *Rear axle group engagement status***

Rear axle group engagement status

00 rear axle group disengaged

01 rear axle group engaged

10 error

11 not available

Data Length:                2 bits

Resolution:                4 states/2 bit, 0 offset

Data Range:                0 to 3

Type:                        Status

Supporting Information:

PGN reference:              61446

Operational Range: same as data range

**(R) SPN 3821      Engine Exhaust Gas Recirculation 1 (EGR1) Valve 2 Control**

Desired percentage of maximum Exhaust Gas Recirculation (EGR) valve opening for valve 2. 0% means valve is closed. 100% means maximum valve opening (full gas flow).

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 2 bytes                |                                       |
| Resolution:             | 0.0025 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 160.6375 %        | Operational Range: same as data range |
| Type:                   | Status                 |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 64879                  |                                       |

**(R) SPN 3822      Engine Exhaust Gas Recirculation 1 Valve 2 Position**

The position of the second exhaust gas recirculation valve expressed as a percentage of full travel. Zero percent means the valve is closed and no exhaust gas is flowing into the intake air stream. One hundred percent means the valve is fully opened.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 2 bytes                |                                       |
| Resolution:             | 0.0025 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 160.6375 %        | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 64916                  |                                       |

**SPN 3823      Transmission Torque Converter Oil Outlet Temperature**

Temperature of transmission torque converter outlet oil.

|                         |                                      |                                       |
|-------------------------|--------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                              |                                       |
| Resolution:             | 0.03125 deg C/bit, -273 deg C offset |                                       |
| Data Range:             | -273 to 1734.96875 deg C             | Operational Range: same as data range |
| Type:                   | Measured                             |                                       |
| Supporting Information: |                                      |                                       |
| PGN reference:          | 64917                                |                                       |

**SPN 3826      Aftertreatment 1 SCR Average Catalyst Reagent Consumption**

Measured use of reagent by a Selective Catalytic Reduction system for exhaust emission control, averaged over the previous 15 hours of engine operation.

Used to determine whether the SCR system is using an appropriate amount of reagent, by comparing with the Commanded Reagent Consumption parameter (SPN 3828).

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bytes                    |                                       |
| Resolution:             | 0.05 L/h per bit, 0 offset |                                       |
| Data Range:             | 0 to 3,212.75 L/h          | Operational Range: same as data range |
| Type:                   | Measured                   |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 64878                      |                                       |

**SPN 3828      *Aftertreatment 1 SCR Commanded Catalyst Reagent Consumption***

This parameter transmits the amount of reagent that the emissions control system has requested to be used, averaged over the past 15 hours of engine operation.

Used to determine whether the SCR system is using an appropriate amount of reagent, by comparing with the Average Reagent Consumption parameter (SPN 3826).

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bytes                    |                                       |
| Resolution:             | 0.05 L/h per bit, 0 offset |                                       |
| Data Range:             | 0 to 3,212.75 L/h          | Operational Range: same as data range |
| Type:                   | Status                     |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 64878                      |                                       |

**SPN 3830      *Aftertreatment 1 Secondary Air Differential Pressure***

Indicates the secondary air differential pressure for aftertreatment 1. Secondary air is air provided to the exhaust system (per SAE J2403).

|                         |                                |                                       |
|-------------------------|--------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                        |                                       |
| Resolution:             | 1/128 kPa/bit, -250 kPa offset |                                       |
| Data Range:             | -250 kPa TO 251.99 kPa         | Operational Range: same as data range |
| Type:                   | Measured                       |                                       |
| Supporting Information: |                                |                                       |
| PGN reference:          | 64877                          |                                       |

**SPN 3831      *Aftertreatment 1 Secondary Air Temperature***

Indicates the secondary air temperature for aftertreatment 1. Secondary air is air provided to the exhaust system (per SAE J2403).

|                         |                                      |                                       |
|-------------------------|--------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                              |                                       |
| Resolution:             | 0.03125 deg C/bit, -273 deg C offset |                                       |
| Data Range:             | -273 to 1734.96875 deg C             | Operational Range: same as data range |
| Type:                   | Measured                             |                                       |
| Supporting Information: |                                      |                                       |
| PGN reference:          | 64877                                |                                       |

**SPN 3832      *Aftertreatment 1 Secondary Air Mass Flow***

Indicates the secondary air mass flow for aftertreatment 1. Secondary air is the air provided to the exhaust system (per SAE J2403).

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bytes                    |                                       |
| Resolution:             | 0.2 kg/h per bit, 0 offset |                                       |
| Data Range:             | 0 to 12851 kg/h per bit    | Operational Range: same as data range |
| Type:                   | Measured                   |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 64877                      |                                       |

**SPN 3833      *Aftertreatment 2 Secondary Air Differential Pressure***

Indicates the secondary air differential pressure for aftertreatment 2. Secondary air is air provided to the exhaust system (per SAE J2403).

|                         |                                |                                       |
|-------------------------|--------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                        |                                       |
| Resolution:             | 1/128 kPa/bit, -250 kPa offset |                                       |
| Data Range:             | -250 kPa TO 251.99 kPa         | Operational Range: same as data range |
| Type:                   | Measured                       |                                       |
| Supporting Information: |                                |                                       |
| PGN reference:          | 64876                          |                                       |

**SPN 3834      *Aftertreatment 2 Secondary Air Temperature***

Indicates the secondary air temperature for aftertreatment 2. Secondary air is air provided to the exhaust system (per SAE J2403).

|                         |                                      |                                       |
|-------------------------|--------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                              |                                       |
| Resolution:             | 0.03125 deg C/bit, -273 deg C offset |                                       |
| Data Range:             | -273 to 1734.96875 deg C             | Operational Range: same as data range |
| Type:                   | Measured                             |                                       |
| Supporting Information: |                                      |                                       |
| PGN reference:          | 64876                                |                                       |

**SPN 3835      *Aftertreatment 2 Secondary Air Mass Flow***

Indicates the secondary air mass flow for aftertreatment 2. Secondary air is the air provided to the exhaust system (per SAE J2403).

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bytes                    |                                       |
| Resolution:             | 0.2 kg/h per bit, 0 offset |                                       |
| Data Range:             | 0 to 12851 kg/h per bit    | Operational Range: same as data range |
| Type:                   | Measured                   |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 64876                      |                                       |

**SPN 3837      *Aftertreatment 1 Secondary Air Pressure***

Pressure of the secondary air for aftertreatment 1. Secondary air is air provided to the exhaust system (per SAE J2403).

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64877                 |                                       |

**SPN 3838      *Aftertreatment 2 Secondary Air Pressure***

Pressure of the secondary air for aftertreatment 2. Secondary air is air provided to the exhaust system (per SAE J2403).

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64876                 |                                       |

**SPN 3839      *Brake Temperature Warning***

This parameter indicates if the temperature in the service brakes exceeds a certain value. It can be used for a warning information for the driver. The temperature warning value is vehicle manufacturer specific.

00 Not Active  
01 Active  
10 Reserved  
11 not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64964                    |                                       |

**SPN 3840      *Auxiliary I/O #17***

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

00 - Auxiliary channel off  
01 - Auxiliary channel on  
10 - Error Indicator or Not Used , depending on application  
11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42752                      |                                       |

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**SPN 3841      Auxiliary I/O #18**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42752                      |                                       |

**SPN 3842      Auxiliary I/O #19**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42752                      |                                       |

**SPN 3843      Auxiliary I/O #20**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42752                      |                                       |

**SPN 3844      Auxiliary I/O #21**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42752                      |                                       |

**SPN 3845      Auxiliary I/O #22**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42752                      |                                       |

**SPN 3846      Auxiliary I/O #23**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42752                      |                                       |



**SPN 3847      Auxiliary I/O #24**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42752                      |                                       |

**SPN 3848      Auxiliary I/O #25**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42752                      |                                       |

**SPN 3849      Auxiliary I/O #26**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42752                      |                                       |

**SPN 3850      Auxiliary I/O #27**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42752                      |                                       |

**SPN 3851      Auxiliary I/O #28**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42752                      |                                       |

**SPN 3852      Auxiliary I/O #29**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42752                      |                                       |

**SPN 3853      Auxiliary I/O #30**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42752                      |                                       |

**SPN 3854      Auxiliary I/O #31**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42752                      |                                       |

**SPN 3855      Auxiliary I/O #32**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42752                      |                                       |

**SPN 3856      Auxiliary I/O #33**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42752                      |                                       |

**SPN 3857      Auxiliary I/O #34**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42752                      |                                       |

**SPN 3858      Auxiliary I/O #35**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42752                      |                                       |

**SPN 3859      Auxiliary I/O #36**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42752                      |                                       |

**SPN 3860      Auxiliary I/O #37**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42752                      |                                       |

**SPN 3861      Auxiliary I/O #38**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42752                      |                                       |

**SPN 3862      Auxiliary I/O #39**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42752                      |                                       |

**SPN 3863      Auxiliary I/O #40**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42752                      |                                       |

**SPN 3864      Auxiliary I/O #41**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42752                      |                                       |

**SPN 3865      Auxiliary I/O #42**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42752                      |                                       |

**SPN 3866      Auxiliary I/O #43**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42752                      |                                       |

**SPN 3867      Auxiliary I/O #44**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42752                      |                                       |

**SPN 3868      Auxiliary I/O #45**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42752                      |                                       |

**SPN 3869      Auxiliary I/O #46**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42752                      |                                       |

**SPN 3870      Auxiliary I/O #47**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42752                      |                                       |



**SPN 3871      Auxiliary I/O #48**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42752                      |                                       |

**SPN 3872      Auxiliary I/O #49**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42496                      |                                       |

**SPN 3873      Auxiliary I/O #50**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42496                      |                                       |

**SPN 3874      Auxiliary I/O #51**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42496                      |                                       |

**SPN 3875      Auxiliary I/O #52**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42496                      |                                       |

**SPN 3876      Auxiliary I/O #53**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42496                      |                                       |

**SPN 3877      Auxiliary I/O #54**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42496                      |                                       |

**SPN 3878      Auxiliary I/O #55**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42496                      |                                       |

**SPN 3879      Auxiliary I/O #56**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42496                      |                                       |

**SPN 3880      Auxiliary I/O #57**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42496                      |                                       |

**SPN 3881      Auxiliary I/O #58**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42496                      |                                       |

**SPN 3882      Auxiliary I/O #59**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42496                      |                                       |

**SPN 3883      Auxiliary I/O #60**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42496                      |                                       |

**SPN 3884      Auxiliary I/O #61**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42496                      |                                       |

**SPN 3885      Auxiliary I/O #62**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42496                      |                                       |

**SPN 3886      Auxiliary I/O #63**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42496                      |                                       |

**SPN 3887      Auxiliary I/O #64**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42496                      |                                       |

**SPN 3888      Auxiliary I/O #65**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42496                      |                                       |

**SPN 3889      Auxiliary I/O #66**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42496                      |                                       |

**SPN 3890      Auxiliary I/O #67**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42496                      |                                       |

**SPN 3891      Auxiliary I/O #68**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42496                      |                                       |

**SPN 3892      Auxiliary I/O #69**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42496                      |                                       |

**SPN 3893      Auxiliary I/O #70**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42496                      |                                       |

**SPN 3894      Auxiliary I/O #71**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42496                      |                                       |



**SPN 3895      Auxiliary I/O #72**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42496                      |                                       |

**SPN 3896      Auxiliary I/O #73**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42496                      |                                       |

**SPN 3897      Auxiliary I/O #74**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42496                      |                                       |

**SPN 3898      Auxiliary I/O #75**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42496                      |                                       |

**SPN 3899      Auxiliary I/O #76**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42496                      |                                       |

**SPN 3900      Auxiliary I/O #77**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42496                      |                                       |

**SPN 3901      Auxiliary I/O #78**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42496                      |                                       |

**SPN 3902      Auxiliary I/O #79**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42496                      |                                       |

**SPN 3903      Auxiliary I/O #80**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42496                      |                                       |

**SPN 3904      Auxiliary I/O #81**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42240                      |                                       |

**SPN 3905      Auxiliary I/O #82**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42240                      |                                       |

**SPN 3906      Auxiliary I/O #83**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42240                      |                                       |

**SPN 3907      Auxiliary I/O #84**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42240                      |                                       |

**SPN 3908      Auxiliary I/O #85**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42240                      |                                       |

**SPN 3909      Auxiliary I/O #86**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42240                      |                                       |

**SPN 3910      Auxiliary I/O #87**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42240                      |                                       |

**SPN 3911      Auxiliary I/O #88**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42240                      |                                       |

**SPN 3912      Auxiliary I/O #89**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42240                      |                                       |

**SPN 3913      Auxiliary I/O #90**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42240                      |                                       |

**SPN 3914      Auxiliary I/O #91**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42240                      |                                       |

**SPN 3915      Auxiliary I/O #92**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42240                      |                                       |

**SPN 3916      Auxiliary I/O #93**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42240                      |                                       |

**SPN 3917      Auxiliary I/O #94**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42240                      |                                       |

**SPN 3918      Auxiliary I/O #95**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42240                      |                                       |



**SPN 3919      Auxiliary I/O #96**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42240                      |                                       |

**SPN 3920      Auxiliary I/O #97**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42240                      |                                       |

**SPN 3921      Auxiliary I/O #98**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42240                      |                                       |

**SPN 3922      Auxiliary I/O #99**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42240                      |                                       |

**SPN 3923      Auxiliary I/O #100**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42240                      |                                       |

**SPN 3924      Auxiliary I/O #101**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42240                      |                                       |

### ***Auxiliary I/O #102***

### ***Auxiliary I/O #103***

### Auxiliary I/O #104

**SPN 3928      Auxiliary I/O #105**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42240                      |                                       |

**SPN 3929      Auxiliary I/O #106**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42240                      |                                       |

**SPN 3930      Auxiliary I/O #107**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42240                      |                                       |

**SPN 3931      Auxiliary I/O #108**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42240                      |                                       |

**SPN 3932      Auxiliary I/O #109**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42240                      |                                       |

**SPN 3933      Auxiliary I/O #110**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42240                      |                                       |

**SPN 3934      Auxiliary I/O #111**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42240                      |                                       |

**SPN 3935      Auxiliary I/O #112**

Identifies the current status of auxiliary input/output functions that are configured uniquely per application.

- 00 - Auxiliary channel off
- 01 - Auxiliary channel on
- 10 - Error Indicator or Not Used , depending on application
- 11 - Not Available or Take No Action, depending on application

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bits                     |                                       |
| Resolution:             | 4 states/2 bit, 0 offset   |                                       |
| Data Range:             | 0 to 3                     | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 42240                      |                                       |

**SPN 3939      Enable Switch - PTO Engine Flywheel**

Status of the PTO Engine Flywheel enable switch

- 00 Enable switch off – PTO operation not desired
- 01 Enable switch on – PTO operation desired
- 10 Error
- 11 Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64932                    |                                       |

**SPN 3940                    Engagement Consent - PTO Engine Flywheel**

Engagement Consent status for the PTO Engine Flywheel

00 Consent not given – PTO drive may not be engaged  
01 Consent given – PTO drive may be engaged  
10 Error  
11 Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64932                    |                                       |

**SPN 3941                    Engagement Status - PTO Engine Flywheel**

Engagement status of the PTO Engine Flywheel

00 Drive not engaged  
01 Drive engaged  
10 Error  
11 Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64932                    |                                       |

**SPN 3942                    Enable Switch - PTO Engine Accessory Drive 1**

Status of the PTO engine accessory drive 1 enable switch

00 Enable switch off – PTO operation not desired  
01 Enable switch on – PTO operation desired  
10 Error  
11 Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64932                    |                                       |

**SPN 3943      Engagement Consent - PTO Engine Accessory Drive 1**

Engagement consent status for the PTO engine accessory drive 1

00 Consent not given – PTO drive may not be engaged

01 Consent given – PTO drive may be engaged

10 Error

11 Not available

Data Length:            2 bits

Resolution:            4 states/2 bit, 0 offset

Data Range:            0 to 3

Type:                    Status

Supporting Information:

PGN reference:        64932

Operational Range: same as data range

**SPN 3944      Engagement Status - PTO Engine Accessory Drive 1**

Engagement status of the PTO engine accessory drive 1

00 Drive not engaged

01 Drive engaged

10 Error

11 Not available

Data Length:            2 bits

Resolution:            4 states/2 bit, 0 offset

Data Range:            0 to 3

Type:                    Status

Supporting Information:

PGN reference:        64932

Operational Range: same as data range

**SPN 3945      Enable Switch - PTO Engine Accessory Drive 2**

Status of the PTO engine accessory drive 2 enable switch

00 Enable switch off – PTO operation not desired

01 Enable switch on – PTO operation desired

10 Error

11 Not available

Data Length:            2 bits

Resolution:            4 states/2 bit, 0 offset

Data Range:            0 to 3

Type:                    Status

Supporting Information:

PGN reference:        64932

Operational Range: same as data range



**SPN 3946      Engagement Consent - PTO Engine Accessory Drive 2**

Engagement Consent status for the PTO engine accessory drive 2

00 Consent not given – PTO drive may not be engaged

01 Consent given – PTO drive may be engaged

10 Error

11 Not available

Data Length:            2 bits

Resolution:            4 states/2 bit, 0 offset

Data Range:            0 to 3

Type:                    Status

Supporting Information:

PGN reference:        64932

Operational Range: same as data range

**SPN 3947      Engagement Status - PTO Engine Accessory Drive 2**

Engagement status of the PTO engine accessory drive 2

00 Drive not engaged

01 Drive engaged

10 Error

11 Not available

Data Length:            2 bits

Resolution:            4 states/2 bit, 0 offset

Data Range:            0 to 3

Type:                    Status

Supporting Information:

PGN reference:        64932

Operational Range: same as data range

**SPN 3948      At least one PTO engaged**

Indicates that at least one PTO is engaged

00 No PTO drive is engaged

01 At least one PTO drive is engaged

10 Error

11 Not available

Note: This parameter should only be sent by the controller that has knowledge of all PTO drives on the vehicle (e.g, the FMS gateway). Individual PTO drive controllers should broadcast this parameter as "not available".

Data Length:            2 bits

Resolution:            4 states/2 bit, 0 offset

Data Range:            0 to 3

Type:                    Status

Supporting Information:

PGN reference:        64932

Operational Range: same as data range

**(R) SPN 3987      Compression Brake Enable Switch Indicator Lamp Command**

Command signal directly controlling Compression Brake Enable Switch Indicator Lamp. The compression brake switch indicator signals the status of the compression brake enable switch to the operator.

00 - Lamp OFF  
01 - Lamp ON  
10 - Reserved  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64775

Operational Range: same as data range

**SPN 4059      Steer Axle Group Weight Available**

Indicates the availability of the steer axle group for purposes of weight measurement

00 = Steer axle group not present  
01 = Steer axle group present  
10 = Reserved  
11 = Not available / not applicable

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64875

Operational Range: same as data range

**SPN 4060      Lift Axle Group Weight Available**

Indicates the availability of the lift axle group for purposes of weight measurement

00 = Lift axle group not present  
01 = Lift axle group present  
10 = Reserved  
11 = Not available / not applicable

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64875

Operational Range: same as data range

**SPN 4061      Drive Axle Group Weight Available**

Indicates the availability of the drive axle group for purposes of weight measurement

00 = Drive axle group not present  
01 = Drive axle group present  
10 = Reserved  
11 = Not available / not applicable

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64875

Operational Range: same as data range

**SPN 4062      Tag Axle Group Weight Available**

Indicates the availability of the tag axle group for purposes of weight measurement

00 = Tag axle group not present  
01 = Tag axle group present  
10 = Reserved  
11 = Not available / not applicable

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64875

Operational Range: same as data range

**SPN 4063      Additional Tractor Axle Group Weight Available**

Indicates the availability of the additional tractor axle group for purposes of weight measurement

00 = Additional tractor axle group not present  
01 = Additional tractor axle group present  
10 = Reserved  
11 = Not available / not applicable

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64875

Operational Range: same as data range

**SPN 4064      Trailer A Axle Group Weight Available**

Indicates the availability of the trailer A axle group for purposes of weight measurement

00 = Trailer A axle group not present  
01 = Trailer A axle group present  
10 = Reserved  
11 = Not available / not applicable

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64875

Operational Range: same as data range

**SPN 4065      Trailer B Axle Group Weight Available**

Indicates the availability of the trailer B axle group for purposes of weight measurement

00 = Trailer B axle group not present  
01 = Trailer B axle group present  
10 = Reserved  
11 = Not available / not applicable

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64875

Operational Range: same as data range

**SPN 4066      Trailer C Axle Group Weight Available**

Indicates the availability of the trailer C axle group for purposes of weight measurement

00 = Trailer C axle group not present  
01 = Trailer C axle group present  
10 = Reserved  
11 = Not available / not applicable

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64875

Operational Range: same as data range

**SPN 4067      Trailer D Axle Group Weight Available**

Indicates the availability of the trailer D axle group for purposes of weight measurement

00 = Trailer D axle group not present  
01 = Trailer D axle group present  
10 = Reserved  
11 = Not available / not applicable

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64875

Operational Range: same as data range

**SPN 4068      Trailer E Axle Group Weight Available**

Indicates the availability of the trailer E axle group for purposes of weight measurement

00 = Trailer E axle group not present  
01 = Trailer E axle group present  
10 = Reserved  
11 = Not available / not applicable

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64875

Operational Range: same as data range

**SPN 4069      Trailer F Axle Group Weight Available**

Indicates the availability of the trailer F axle group for purposes of weight measurement

00 = Trailer F axle group not present  
01 = Trailer F axle group present  
10 = Reserved  
11 = Not available / not applicable

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64875

Operational Range: same as data range

**SPN 4070      Trailer G Axle Group Weight Available**

Indicates the availability of the trailer G axle group for purposes of weight measurement

00 = Trailer G axle group not present  
01 = Trailer G axle group present  
10 = Reserved  
11 = Not available / not applicable

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64875

Operational Range: same as data range

**SPN 4071      Trailer H Axle Group Weight Available**

Indicates the availability of the trailer H axle group for purposes of weight measurement

00 = Trailer H axle group not present  
01 = Trailer H axle group present  
10 = Reserved  
11 = Not available / not applicable

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64875

Operational Range: same as data range

**SPN 4072      Additional Trailer Axle Group Weight Available**

Indicates the availability of the additional trailer axle group for purposes of weight measurement

00 = Additional trailer axle group not present  
01 = Additional trailer axle group present  
10 = Reserved  
11 = Not available / not applicable

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64875

Operational Range: same as data range

**SPN 4073      Axle Group Location**

Specific axle group used in conjunction with and when communicating the axle group weight, listed from the front of the vehicle to the rear.

- 0 = Reserved
- 1 = Steer axle group
- 2 = Lift axle group
- 3 = Drive axle group
- 4 = Tag axle group
- 5 = Additional tractor axle group
- 6 = Trailer A axle group
- 7 = Trailer B axle group
- 8 = Trailer C axle group
- 9 = Trailer D axle group
- 10 = Trailer E axle group
- 11 = Trailer F axle group
- 12 = Trailer G axle group
- 13 = Trailer H axle group
- 14 = Additional trailer axle group
- 15 = Reserved

Data Length:            4 bits  
Resolution:            16 states/4 bit, 0 offset  
Data Range:            0 to 15  
Type:                    Measured  
Supporting Information:  
PGN reference:        64874

Operational Range: same as data range

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**SPN 4074      Axle Group Location**

Specific axle group used in conjunction with and when communicating the axle group calibration, listed from the front of the vehicle to the rear.

- 0 = Reserved
- 1 = Steer axle group
- 2 = Lift axle group
- 3 = Drive axle group
- 4 = Tag axle group
- 5 = Additional tractor axle group
- 6 = Trailer A axle group
- 7 = Trailer B axle group
- 8 = Trailer C axle group
- 9 = Trailer D axle group
- 10 = Trailer E axle group
- 11 = Trailer F axle group
- 12 = Trailer G axle group
- 13 = Trailer H axle group
- 14 = Additional trailer axle group
- 15 = Reserved

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64873                     |                                       |

**SPN 4075      Zero Net Vehicle Weight Change**

Zero Net Vehicle Weight Change command. A controller receiving this command will record the current Gross Combination Weight as the new Zero, and future requests for Net Vehicle Weight Change will be answered with the difference between the (then) current Gross Combination Weight and the recorded value.

- 00 - No change to Net Vehicle Weight Change
- 01 - Zero Net Vehicle Weight Change
- 10 - Reserved
- 11 - Not available / Not applicable

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64871                    |                                       |



**SPN 4076      Engine Coolant Temperature 2**

Second temperature of liquid found in the engine cooling system. See also SPN 110.

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 deg C/bit, -40 deg C offset |                                       |
| Data Range:             | -40 to 210 deg C              | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          | 64870                         |                                       |

**SPN 4077      Aftertreatment 1 Fuel Pressure 2**

Second fuel pressure measurement for the aftertreatment 1 system

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64869                 |                                       |

**SPN 4082      Fuel Pump Primer Control**

Parameter used to activate or deactivate a priming system on the fuel transfer system. The fuel priming system is a system that purges air in the fuel lines and may assist fuel delivery to a second pump at lower speeds.

00 = Deactivate  
01 = Activate  
10 = Reserved  
11 = Unavailable

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64914                    |                                       |

**SPN 4083      Fuel Pump Primer Status**

Parameter used to transmit the actual status of the fuel priming system. The fuel priming system is a system that purges air in the fuel lines and may assist fuel delivery to a second pump at lower speeds.

00 – Off  
01 – On  
10 – Error  
11 – Unavailable

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65130

Operational Range: same as data range

**SPN 4086      Valve Load Sense Pressure**

The maximum of the currently measured pressures of a valve's work port A and work port B.

Data Length:            2 bytes  
Resolution:            5 kPa/bit, 0 offset  
Data Range:            0 to 321,275 kPa  
Type:                    Measured  
Supporting Information:  
PGN reference:        1792

Operational Range: same as data range

**SPN 4087      Valve Pilot Pressure**

Pressure of a valve's pilot supply port.

Data Length:            1 byte  
Resolution:            16 kPa/bit, 0 offset  
Data Range:            0 to 4000 kPa  
Type:                    Measured  
Supporting Information:  
PGN reference:        1792

Operational Range: same as data range

**SPN 4088      Valve Assembly Load sense Pressure**

The maximum pressure of a valve assembly's current collective load sense pressures where a valve assembly can consist of two or more valves.

Data Length:            2 bytes  
Resolution:            5 kPa/bit, 0 offset  
Data Range:            0 to 321,275 kPa  
Type:                    Measured  
Supporting Information:  
PGN reference:        1792

Operational Range: same as data range

**SPN 4089      Valve Assembly Supply Pressure**

Pressure of the hydraulic supply port to a valve assembly.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 2 bytes             |                                       |
| Resolution:             | 5 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 321,275 kPa    | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 1792                |                                       |

**SPN 4097      Aftertreatment 1 Fuel Drain Actuator**

Indicates whether aftertreatment 1 fuel drain actuator is on or off

00 not active  
01 active  
10 reserved for SAE assignment  
11 not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64929                    |                                       |

**SPN 4098      Aftertreatment 2 Fuel Drain Actuator**

Indicates whether aftertreatment 2 fuel drain actuator is on or off

00 not active  
01 active  
10 reserved for SAE assignment  
11 not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64928                    |                                       |

**SPN 4099*****XBR urgency***

The idea of the urgency value is to adjust the endurance brake integration behavior in the EBS system according to the traffic situation.

On low urgency values (0%, e.g. downhill cruise control or preceding vehicle far ahead) the brake system shall primarily use endurance brakes to reduce lining wear.

On high urgency values (100%, e.g. vehicle close up or a vehicle cuts into the traffic line just before host vehicle) the brake system is expected to gain the demanded deceleration (acceleration) as fast as possible.

**Values:**

0% - Situation not critical; low retarder dynamics are tolerated. Activation of the foundation brakes after a time if retarder performance is insufficient

y % - Faster activation of foundation brakes to compensate retarder performance, linear interpolation between 0 and 100%

100% - Low retarder dynamics shall be fully compensated by the foundation brakes

**Notes:**

- This parameter has only an effect if XBR EBI switch is set to "10: endurance brake integration allowed"

- XBR urgency makes sense only if the XBR request(s) is (are) processed in one device like the EBS controller which also sends TSC1 to the retarder(s). Such a data flow diagram is shown in figure PGN1024\_A. When the Retarder is controlled directly by the XBR transmitter XBR urgency should be set to not available.

In adaptive cruise control (ACC) operation there are situations where it is useful to have as less lining wear as possible like keeping the set speed on going downhill. It would not be useful to activate foundation brakes in such a situation except when the capabilities of the endurance brakes are not sufficient.

In other situations like emergency braking or fast reaction on a car that cut in at a short distance in front of the own vehicle a reaction as fast as possible is needed. In such cases low retarder dynamics must be compensated by the foundation brakes.

There are two different ways to integrate the endurance brakes into the adaptive cruise control.

a) the request for deceleration could be processed by the EBS system completely. This means that the EBS receives the deceleration demand and activates the friction and/or the endurance brakes accordingly. EBS is sending the TSC1 to the retarder. (see figure PGN1024\_A dataflow diagram for external brake request)

b) the ACC sends XBR to the brake controller and TSC1 to the endurance brakes.

In case "a)" the ACC system does not have direct control of the endurance brakes. To adjust the endurance brakes according to the traffic situation (high or low urgency values see above) this new SPN is needed.

If the retarder performance is not sufficient (e.g. because of high retarder temperature) the foundation brakes will be added automatically. This case of not sufficient retarder performance cannot be covered by switching EBI mode from 01 (endurance brakes only) to EBI mode 10 (endurance brake integration allowed) because the actual deceleration caused by the retarder is less than the requested deceleration. A simple switching (01 to 10) would cause an uncomfortable jerk.

**NOTE:** This parameter is defined in European patent EP 1 386 774 B1 (see reference in section 2.1.3) and is included with permission from the patent holder. The patent holder is prepared to grant a free license to an unrestricted number of applicants on a worldwide, non-discriminatory basis to comply with this recommended practice.

Data Length: 1 byte

Resolution: 0.4 %/bit, 0 offset

Data Range: 0 to 100 %

Type: Status

Supporting Information:

PGN reference: 1024

Operational Range: same as data range

**SPN 4151      Engine Exhaust Gas Temperature Average**

The calculated average temperature based upon all of the engine exhaust port temperatures. This is the average temperature based upon the exhaust port temperature measurements at each of the engine cylinders.

**Notes:**

Use SPN 173 - Engine Exhaust Gas Temperature to report the actual measured temperature of the exhaust for the entire engine, after the turbocharger.

See SPN 2433 - Engine Exhaust Gas Temperature - Right Manifold, and SPN 2434 - Engine Exhaust Gas Temperature - Left Manifold to report the actual measured temperature of the manifold for engines requiring more than one exhaust temperature measurement.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Status  
Supporting Information: See Appendix D - SPN 4151  
PGN reference: 64851

**SPN 4152      Engine Exhaust Gas Temperature Average - Bank 2**

The calculated average temperature based upon all of the Bank 2 (right bank) engine exhaust port temperatures. This is the average temperature based upon the exhaust port temperature measurements of each of the engine cylinders on the right bank before the turbocharger.

Use SPN 2433 Engine Exhaust Gas Temperature - Right Manifold to report the actual measured temperature of the manifold on the right side as seen from the flywheel end of the engine.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Status  
Supporting Information: See Appendix D - SPN 4151  
PGN reference: 64851

**SPN 4153      Engine Exhaust Gas Temperature Average - Bank 1**

The calculated average temperature based upon all of the Bank 1 (left bank) engine exhaust port temperatures. This is the average temperature based upon the exhaust port temperature measurements of each of the engine cylinders on the left bank prior to the turbocharger.

Use SPN 2434 Engine Exhaust Gas Temperature - Left Manifold to report the actual measured temperature of the manifold on the left side as seen from the flywheel end of the engine.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Status  
Supporting Information: See Appendix D - SPN 4151  
PGN reference: 64851

**SPN 4154      Actual Engine - Percent Torque High Resolution**

This parameter displays an additional torque in percent of the reference engine torque.

When the MSB is set to 1, this parameter is not available. When the MSB is set to 0, bits 1 to 3 indicate the desired torque with resolution of 0.125%/bit. Range is from 0 to 0.875% of reference torque.

The parameter is used in combination with SPN 513 Actual Engine Torque. The resulting actual engine torque will be calculated by adding these two parameters.

Additional torque representations

0000 = +0.000%

0001 = +0.125%

.

.

.

0111 = +0.875%

1000 - 1111 = not available

For example, if SPN 513 = 150 (or 25%) and this parameter is 0100, the torque would be 25.5%.

If SPN 513 = 175 (or 50%) and this parameter is 0001, the torque would be 50.125%

If SPN 513 = 175 (or 50%) and this parameter is 1111, the torque would remain 50% (no high resolution available)

Data Length:            4 bits

Resolution:            0.125%/bit, 0 offset

Data Range:            0 to 0.875%

Operational Range: same as data range

Type:                    Measured

Supporting Information:

PGN reference:        61444

**SPN 4155      Auxiliary I/O Channel #6**

Identifies the current value of auxiliary input/output channels that are configured uniquely per application.

Data Length:            2 bytes

Resolution:            1 count/bit, 0 offset

Data Range:            0 to 64,255 counts

Operational Range: same as data range

Type:                    Dependent upon Application

Supporting Information:

PGN reference:        2048

**SPN 4156      Auxiliary I/O Channel #5**

Identifies the current value of auxiliary input/output channels that are configured uniquely per application.

Data Length:            2 bytes

Resolution:            1 count/bit, 0 offset

Data Range:            0 to 64,255 counts

Operational Range: same as data range

Type:                    Dependent upon Application

Supporting Information:

PGN reference:        2048

**SPN 4157      Auxiliary I/O Channel #4**

Identifies the current value of auxiliary input/output channels that are configured uniquely per application.

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bytes                    |                                       |
| Resolution:             | 1 count/bit, 0 offset      |                                       |
| Data Range:             | 0 to 64,255 counts         | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 2048                       |                                       |

**SPN 4158      Auxiliary I/O Channel #3**

Identifies the current value of auxiliary input/output channels that are configured uniquely per application.

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bytes                    |                                       |
| Resolution:             | 1 count/bit, 0 offset      |                                       |
| Data Range:             | 0 to 64,255 counts         | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 2048                       |                                       |

**SPN 4159      Auxiliary I/O Channel #10**

Identifies the current value of auxiliary input/output channels that are configured uniquely per application.

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 1 byte                     |                                       |
| Resolution:             | 1 count/bit, 0 offset      |                                       |
| Data Range:             | 0 to 250                   | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 40192                      |                                       |

**SPN 4160      Auxiliary I/O Channel #9**

Identifies the current value of auxiliary input/output channels that are configured uniquely per application.

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 1 byte                     |                                       |
| Resolution:             | 1 count/bit, 0 offset      |                                       |
| Data Range:             | 0 to 250                   | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 40192                      |                                       |

**SPN 4161      Auxiliary I/O Channel #8**

Identifies the current value of auxiliary input/output channels that are configured uniquely per application.

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 1 byte                     |                                       |
| Resolution:             | 1 count/bit, 0 offset      |                                       |
| Data Range:             | 0 to 250                   | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 40192                      |                                       |

**SPN 4162      Auxiliary I/O Channel #7**

Identifies the current value of auxiliary input/output channels that are configured uniquely per application.

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 1 byte                     |                                       |
| Resolution:             | 1 count/bit, 0 offset      |                                       |
| Data Range:             | 0 to 250                   | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 40192                      |                                       |

**SPN 4163      Auxiliary I/O Channel #14**

Identifies the current value of auxiliary input/output channels that are configured uniquely per application.

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 1 byte                     |                                       |
| Resolution:             | 1 count/bit, 0 offset      |                                       |
| Data Range:             | 0 to 250                   | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 40192                      |                                       |

**SPN 4164      Auxiliary I/O Channel #13**

Identifies the current value of auxiliary input/output channels that are configured uniquely per application.

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 1 byte                     |                                       |
| Resolution:             | 1 count/bit, 0 offset      |                                       |
| Data Range:             | 0 to 250                   | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 40192                      |                                       |



**SPN 4165      Auxiliary I/O Channel #12**

Identifies the current value of auxiliary input/output channels that are configured uniquely per application.

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 1 byte                     |                                       |
| Resolution:             | 1 count/bit, 0 offset      |                                       |
| Data Range:             | 0 to 250                   | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 40192                      |                                       |

**SPN 4166      Auxiliary I/O Channel #11**

Identifies the current value of auxiliary input/output channels that are configured uniquely per application.

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 1 byte                     |                                       |
| Resolution:             | 1 count/bit, 0 offset      |                                       |
| Data Range:             | 0 to 250                   | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 40192                      |                                       |

**SPN 4167      Auxiliary I/O Channel #18**

Identifies the current value of auxiliary input/output channels that are configured uniquely per application.

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 1 byte                     |                                       |
| Resolution:             | 1 count/bit, 0 offset      |                                       |
| Data Range:             | 0 to 250                   | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 39936                      |                                       |

**SPN 4168      Auxiliary I/O Channel #17**

Identifies the current value of auxiliary input/output channels that are configured uniquely per application.

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 1 byte                     |                                       |
| Resolution:             | 1 count/bit, 0 offset      |                                       |
| Data Range:             | 0 to 250                   | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 39936                      |                                       |

**SPN 4169      Auxiliary I/O Channel #16**

Identifies the current value of auxiliary input/output channels that are configured uniquely per application.

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 1 byte                     |                                       |
| Resolution:             | 1 count/bit, 0 offset      |                                       |
| Data Range:             | 0 to 250                   | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 39936                      |                                       |

**SPN 4170      Auxiliary I/O Channel #15**

Identifies the current value of auxiliary input/output channels that are configured uniquely per application.

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 1 byte                     |                                       |
| Resolution:             | 1 count/bit, 0 offset      |                                       |
| Data Range:             | 0 to 250                   | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 39936                      |                                       |

**SPN 4171      Auxiliary I/O Channel #22**

Identifies the current value of auxiliary input/output channels that are configured uniquely per application.

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 1 byte                     |                                       |
| Resolution:             | 1 count/bit, 0 offset      |                                       |
| Data Range:             | 0 to 250                   | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 39936                      |                                       |

**SPN 4172      Auxiliary I/O Channel #21**

Identifies the current value of auxiliary input/output channels that are configured uniquely per application.

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 1 byte                     |                                       |
| Resolution:             | 1 count/bit, 0 offset      |                                       |
| Data Range:             | 0 to 250                   | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 39936                      |                                       |

**SPN 4173      Auxiliary I/O Channel #20**

Identifies the current value of auxiliary input/output channels that are configured uniquely per application.

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 1 byte                     |                                       |
| Resolution:             | 1 count/bit, 0 offset      |                                       |
| Data Range:             | 0 to 250                   | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 39936                      |                                       |

**SPN 4174      Auxiliary I/O Channel #19**

Identifies the current value of auxiliary input/output channels that are configured uniquely per application.

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 1 byte                     |                                       |
| Resolution:             | 1 count/bit, 0 offset      |                                       |
| Data Range:             | 0 to 250                   | Operational Range: same as data range |
| Type:                   | Dependent upon Application |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 39936                      |                                       |

**SPN 4175      Diesel Particulate Filter Active Regeneration Forced Status**

Indicates the forced execution status of diesel particulate filter regeneration.

000 Not Active  
001 Active – Forced by Switch (See SPN 3696)  
010 Active – Forced by Service Tool  
011 Reserved for SAE Assignment  
100 Reserved for SAE Assignment  
101 Reserved for SAE Assignment  
110 Reserved for SAE Assignment  
111 not available

This SPN indicates the forced execution status of diesel particulate filter regeneration. The SPN would be “Not Active” when the execution of diesel particulate filter regeneration has not been forced. Either of the states “Active – Forced by Switch” and “Active – Forced by Service Tool” will be active when execution of diesel particulate filter regeneration is forced, providing feedback as to which entity forced the execution of diesel particulate filter regeneration.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 3 bits                   |                                       |
| Resolution:             | 8 states/3 bit, 0 offset |                                       |
| Data Range:             | 0 to 7                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64892                    |                                       |

**SPN 4176      *Transmission Current Range Display Blank State***

State signal indicating a transmission request for the display of the Transmission Current Range parameter (SPN 163) to be blanked or not blanked. The 'Transmission Current Range Display Blank State' indicator can be utilized by (but not limited to) the shift console, instrument cluster, or cab display. Definition of the cause of this state is at the discretion of the transmission manufacturer.

00=Not Blanked  
01=Blanked  
10=Error  
11=Not Supported

Note: This is a companion of SPN 1850, that will allow the "current range" display to be blanked as needed while still retaining a valid current range broadcast in SPN 163.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65098                    |                                       |

**SPN 4177      *Transmission Oil Life Remaining***

Signal which indicates the actual oil life remaining in percent. 100% means the transmission oil is brand new, and 0% means the transmission oil is at the end of its life.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64917               |                                       |

**SPN 4178      *Transmission Service Indicator***

Signal from transmission indicating that some aspect of the gearbox requires servicing, such as the oil, filter, clutch(es) or other component.

00 Transmission Service Indicator is off  
01 Transmission Service Indicator is on continuously  
10 Transmission Service Indicator is flashing  
11 Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65098                    |                                       |

**SPN 4180      Data Dictionary Manufacturer Code**

The J1939 Manufacturer Code (see J1939 Table B10) associated with the manufacturer who defined the proprietary communications method. 0x7FF reserved for "Not Available"

|                         |                             |                                       |
|-------------------------|-----------------------------|---------------------------------------|
| Data Length:            | 11 bits                     |                                       |
| Resolution:             | 2047 states/11bit, 0 offset |                                       |
| Data Range:             | 0 to 2047                   | Operational Range: same as data range |
| Type:                   | Status                      |                                       |
| Supporting Information: |                             |                                       |
| PGN reference:          | 39680                       |                                       |

**SPN 4181      Data Dictionary Method**

A manufacturer defined code to define the proprietary communications method. The structure and interpretation of the code is manufacturer specific. This allows manufacturers to establish their own methods for reporting proprietary support for PropA, PropA2, and PropB messages.

|                         |                                |                                       |
|-------------------------|--------------------------------|---------------------------------------|
| Data Length:            | 21 bits                        |                                       |
| Resolution:             | 2097151 states/21bit, 0 offset |                                       |
| Data Range:             | 0 to 2097151                   | Operational Range: same as data range |
| Type:                   | Status                         |                                       |
| Supporting Information: |                                |                                       |
| PGN reference:          | 39680                          |                                       |

**SPN 4191      Engine Requested Torque - High Resolution**

This parameter displays an additional torque in percent of the reference engine torque.

When the MSB is set to 1, this parameter is not available. When the MSB is set to 0, bits 1 to 3 indicate the desired torque with resolution of 0.125%/bit. Range is from 0 to 0.875% of reference torque.

The parameter is used in combination with SPN 518 Engine Requested Torque/Torque Limit. The resulting torque/torque limit will be calculated by adding these two parameters.

Validity of Engine Requested Torque High Res has no effect on SPN 518.

Additional torque representations

0000 = +0.000%

0001 = +0.125%

.

.

.

0111 = +0.875%

1000 - 1111 = not available

For example, if SPN 518 = 150 (or 25%) and this parameter is 0100, the torque would be 25.5%.

If SPN 518 = 175 (or 50%) and this parameter is 0001, the torque would be 50.125%

If SPN 518 = 175 (or 50%) and this parameter is 1111, the torque would remain 50% (no high resolution available)

Data Length:            4 bits

Resolution:            0.125%/bit, 0 offset

Data Range:            0 to 0.875%

Operational Range: same as data range

Type:                    Measured

Supporting Information:

PGN reference:        0

**SPN 4193      Engine Coolant Pump Outlet Temperature**

The actual value of engine coolant temperature at the coolant pump outlet

Data Length:            1 byte

Resolution:            1 deg C/bit, -40 deg C offset

Data Range:            -40 to 210 deg C

Operational Range: same as data range

Type:                    Measured

Supporting Information:

PGN reference:        64870

**SPN 4194      Engine Coolant Thermostat Opening**

The current position of the Thermostat used to regulate the temperature of the engine coolant. 0% represents the thermostat allows flow to completely bypass the radiator and 100% represents the flow is fully through the radiator.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64870               |                                       |

**SPN 4195      Engine Coolant Thermostat Mode**

Specifies if the engine coolant thermostat valve will operate in temperature control mode or position control mode.

00 = temperature control mode  
01 = position control mode (used for service only)  
10 = reserved  
11 = don't care/reserved

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64850                    |                                       |

**SPN 4196      Desired Engine Coolant Pump Outlet Temperature**

Desired engine coolant temperature of the engine to an electronic thermostat. If the electronic thermostat valve is operating in position control mode (see SPN 4195) then transmit 0xFF.

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 deg C/bit, -40 deg C offset |                                       |
| Data Range:             | -40 to 210 deg C              | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          | 64850                         |                                       |

**SPN 4197      Desired Engine Coolant Thermostat Opening**

Indicates the desired position of the engine coolant control valve. 0% represents the thermostat allows flow to completely bypass the radiator and 100% represents the flow is fully through the radiator. If the electronic thermostat is operating in temperature control mode (SPN 4195) then transmit 0xFF.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Status              |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64850               |                                       |

**SPN 4198      *Aftercooler Coolant Thermostat Mode***

Specifies if the aftercooler coolant thermostat valve will operate in temperature control mode or position control mode.

00 = temperature control mode  
01 = position control mode (used for service only)  
10 = reserved  
11 = don't care/reserved

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64849                    |                                       |

**(R) SPN 4199      *Desired Aftercooler Coolant Intake Temperature***

Indicates the desired temperature of the fluid in the low temperature aftercooler circuit to an electronic thermostat. If the aftercooler coolant thermostat valve is operating in position control mode (see SPN 4198) then this value should be 0xFF.

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 deg C/bit, -40 deg C offset |                                       |
| Data Range:             | -40 to 210 deg C              | Operational Range: same as data range |
| Type:                   | Status                        |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          | 64849                         |                                       |

**SPN 4200      *Desired Aftercooler Coolant Thermostat Opening***

Used to transmit the desired position of the low temperature aftercooler temperature control valve. 0% represents the thermostat allows flow to completely bypass the aftercooler and 100% represents the flow is fully through the aftercooler. If the aftercooler coolant thermostat is operating in temperature control mode (see SPN 4198) then this value should be 0xFF.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Status              |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64849               |                                       |



**SPN 4201      Engine Speed 1**

The engine speed as measured by speed sensor 1.

Note: This is for the engine speed from the 1st engine speed sensor. This may be different than SPN 190 when used in multiple engine speed sensor configurations. In an application with only one speed sensor, SPN 190 will represent both the speed and the sensor for diagnostic purposes and SPN 4201 will not be used. However, in an application with multiple engine speed sensors, SPN 190 data can be derived from any of the speed sensors.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.5 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 32,127.5 rpm     | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 61473                 |                                       |

**SPN 4202      Engine Speed 3**

The engine speed as measured by speed sensor 3.

Note: This is for the engine speed from the 3rd engine speed sensor. This may be different than SPN 190 when used in multiple engine speed sensor configurations. In an application with multiple engine speed sensors, SPN 190 data can be derived from any of the speed sensors.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.5 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 32,127.5 rpm     | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 61473                 |                                       |

**SPN 4203      Engine Speed Sensor 1 Timing Pattern Status**

This is the timing pattern status of the engine speed sensor signal for sensor 1. The sensor may be sending a speed signal but the pattern may not be valid. Since the speed is considered valid, the error indicator will not be used in the engine speed parameter (SPN 4201). The sensor does give a speed but the pattern is not matched. In this condition, the position of the crank has not been determined so injection is not enabled. The engine speed signal provides both engine speed and crankshaft location information to the engine control. A "Not OK" status may be caused by extra or missing teeth, gear runout, etc.

00 = Not OK  
01 = OK  
10 = Error  
11 = Not available

Note: This is intended to be used on a service tool for troubleshooting a no start condition.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61473                    |                                       |

**SPN 4204      Engine Speed Sensor 2 Timing Pattern Status**

This is the timing pattern status of the engine speed sensor signal for sensor 2. The sensor may be sending a speed signal but the pattern may not be valid. Since the speed is considered valid, the error indicator will not be used in the engine speed parameter (SPN 723).

00 = Not OK  
01 = OK  
10 = Error  
11 = Not available

Note: This is intended to be used on a service tool for troubleshooting a no start condition. The sensor does give a speed but the pattern is not matched. In this condition, the position of the crank has not been determined so injection is not enabled. The engine speed signal provides both engine speed and crankshaft location information to the engine control. A "Not OK" status may be caused by extra or missing teeth, gear runout, etc.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61473                    |                                       |

**SPN 4205      Engine Speed Sensor 3 Timing Pattern Status**

This is the timing pattern status of the engine speed sensor signal for sensor 3. The sensor may be sending a speed signal but the pattern may not be valid. Since the speed is considered valid, the error indicator will not be used in the engine speed parameter (SPN 4202).

00 = Not OK  
01 = OK  
10 = Error  
11 = Not available

Note: This is intended to be used on a service tool for troubleshooting a no start condition. The sensor does give a speed but the pattern is not matched. In this condition, the position of the crank has not been determined so injection is not enabled. The engine speed signal provides both engine speed and crankshaft location information to the engine control. A "Not OK" status may be caused by extra or missing teeth, gear runout, etc.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61473                    |                                       |

**SPN 4206      Message Counter**

The message counter is used to detect situations where the transmitting ECU malfunction repeats the same frame all the time. The receiver of the information may use the counter parameter to detect this situation. The transmitting device will increase the message counter in every cycle. The message counter will count from 0 to 7 and then wrap.

The values 0x8 thru 0xE are SAE reserved and should be ignored by the receiver.

Value 0xF (all bits set to 1) will indicate that the message counter is not available. For compatibility purposes, TSC1 should also be honored if the message counter is not available from the transmitting device.

|                         |                       |                                              |
|-------------------------|-----------------------|----------------------------------------------|
| Data Length:            | 4 bits                |                                              |
| Resolution:             | 1 count/bit, 0 offset |                                              |
| Data Range:             | 0 to 15               | Operational Range: 0 to 7 and 15 exclusively |
| Type:                   | Status                |                                              |
| Supporting Information: |                       |                                              |
| PGN reference:          | 0                     |                                              |

**SPN 4207      Message Checksum**

The message checksum is used to verify the signal path from the transmitting device to the receiving device.

The message checksum is calculated using the first 7 data bytes, the message counter and the bytes of the message identifier. It is calculated as follows:

Checksum = (Byte1 + Byte2 + Byte3 + Byte4 + Byte5 + Byte6 + Byte7 + message counter & 0x0F + message ID low byte + message ID mid low byte + message ID mid high byte + message ID high byte)

Message Checksum = (((Checksum >> 6) & 0x03) + (Checksum >>3) + Checksum) & 0x07

Value 0xF (all bits set to 1) will indicate that the checksum is not available. For compatibility purposes, TSC1 should also be honored if the checksum is not available from the transmitting device.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 4 bits                |                                       |
| Resolution:             | 1 count/bit, 0 offset |                                       |
| Data Range:             | 0 to 15               | Operational Range: same as data range |
| Type:                   | Status                |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 0                     |                                       |

**SPN 4211      Hydraulic Fan Motor Pressure**

The hydraulic pressure used to drive the fan system, sensed before the hydraulic fan motor.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.5 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 32,127.5 kPa     | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 65213                 |                                       |

**SPN 4212      Fan Drive Bypass Command Status**

Status of the Fan Drive Bypass Command as being commanded by the ECU. The fan drive bypass diverts pump pressure away from the hydraulic motor to maintain the fan drive pressure. 0% is defined as no bypass (i.e. diverting no fan drive pressure) and 100% is defined as full bypass (i.e. diverting the maximum fan drive pressure) from the fan motor.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Status              |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65213               |                                       |

**SPN 4233      Retarder Road Speed Limit Switch**

Retarder road speed limit switch states:

- 00 Road speed limiting by retarder is disabled
- 01 Road speed limiting by retarder is enabled. The road speed that the retarder will limit will be determined when the switch transitions from 00 to 01
- 10 Error Indicator
- 11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61440                    |                                       |

**SPN 4234      Retarder Road Speed Exceeded Status**

Retarder Road Speed Exceeded Status:

- 00 Road speed is below threshold
- 01 Road speed is above threshold and retarder is allowed to be activated
- 10 Reserved
- 11 Don't care/Take no action

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61440                    |                                       |

**SPN 4236      *Short-term Fuel Trim - Bank 1***

This parameter is the short-term percent change in fueling based on the O2 sensor feedback for cylinder bank 1, based on the operating point in the nominal fuel map.

Note: This is similar to SPN 1695, but with higher resolution.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 2 bytes                |                                       |
| Resolution:             | 0.1 %/bit, -100 offset |                                       |
| Data Range:             | -100 to 100 %          | Operational Range: same as data range |
| Type:                   | Status                 |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 64841                  |                                       |

**SPN 4237      *Long-term Fuel Trim - Bank 1***

This parameter is the long-term percent change in fueling based on the O2 sensor feedback for cylinder bank 1, based on the operating point in the nominal fuel map.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 2 bytes                |                                       |
| Resolution:             | 0.1 %/bit, -100 offset |                                       |
| Data Range:             | -100 to 100 %          | Operational Range: same as data range |
| Type:                   | Status                 |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 64841                  |                                       |

**SPN 4238      *Short-term Fuel Trim - Bank 2***

This parameter is the short-term percent change in fueling based on the O2 sensor feedback for cylinder bank 2, based on the operating point in the nominal fuel map.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 2 bytes                |                                       |
| Resolution:             | 0.1 %/bit, -100 offset |                                       |
| Data Range:             | -100 to 100 %          | Operational Range: same as data range |
| Type:                   | Status                 |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 64840                  |                                       |

**SPN 4239      *Long-term Fuel Trim - Bank 2***

This parameter is the long-term percent change in fueling based on the O2 sensor feedback for cylinder bank 2, based on the operating point in the nominal fuel map.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 2 bytes                |                                       |
| Resolution:             | 0.1 %/bit, -100 offset |                                       |
| Data Range:             | -100 to 100 %          | Operational Range: same as data range |
| Type:                   | Status                 |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 64840                  |                                       |

**SPN 4240      Engine Exhaust Gas Oxygen Sensor Closed Loop Operation, Bank 1**

This parameter indicates the status of the bank 1 O2 sensor feedback closed loop operation

0000 = Open loop - has not yet satisfied conditions to go closed loop

0001 = Closed loop - using oxygen sensor(s) as feedback for fuel control

0010 = Open loop due to driving conditions (e.g., power enrichment, deceleration enrichment)

0011 = Open loop - due to detected system fault

0100 = Closed loop, but fault with at least one oxygen sensor - may be using single oxygen sensor for fuel control

0101-1110 = reserved

1111 = not supported

See also SPN 1696 as an prior implementation.

Data Length:            4 bits

Resolution:            16 states/4 bit, 0 offset

Data Range:            0 to 15

Operational Range: same as data range

Type:                    Status

Supporting Information:

PGN reference:        64841

**SPN 4241      Engine Exhaust Gas Oxygen Sensor Closed Loop Operation, Bank 2**

This parameter indicates the status of the bank 2 O2 sensor feedback closed loop operation

0000 = Open loop - has not yet satisfied conditions to go closed loop

0001 = Closed loop - using oxygen sensor(s) as feedback for fuel control

0010 = Open loop due to driving conditions (e.g., power enrichment, deceleration enrichment)

0011 = Open loop - due to detected system fault

0100 = Closed loop, but fault with at least one oxygen sensor - may be using single oxygen sensor for fuel control

0101-1110 = reserved

1111 = not supported

Data Length:            4 bits

Resolution:            16 states/4 bit, 0 offset

Data Range:            0 to 15

Operational Range: same as data range

Type:                    Status

Supporting Information:

PGN reference:        64840

**SPN 4242      *Transmission Reverse Gear Shift Inhibit Request***

Allows devices external to the normal transmission shift selector system to request the transmission to inhibit shifts into any Reverse gear and force the transmission into Neutral if it is currently in Reverse or attempting to shift to Reverse. These transmission responses occur regardless of shift selector (Forward, Neutral or Reverse) position at the time the request is received.

This request would typically come from a component wishing to override the vehicle operator's ability to shift or keep the transmission in Reverse. For example, the control system of a rear-loading refuse packer may wish to prevent shifts to reverse when it detects the presence of someone behind the vehicle.

Reverse gear shift inhibits include all 'Neutral-to-Reverse' shifts and 'Forward-to-Reverse' shifts; the ability of the transmission to complete 'Neutral-to-Forward' or 'Forward-to-Forward' gear shifts is not impacted.

If the transmission is in Reverse or attempting to shift to Reverse and receives an active Reverse gear shift inhibit request (0b01), the transmission will shift to Neutral. When the request subsequently goes inactive (0b00), the transmission will remain in Neutral until it receives a selector input from the vehicle operator requesting it to shift into a Non-Neutral gear. The transmission should not automatically return to the previous gear when this signal goes inactive.

Transmission response to this request can be monitored via SPN 4261 – Transmission Reverse Gear Shift Inhibit Status, SPN 523 Transmission Current Gear, and SPN 524 Transmission Selected Gear.

00 = Allow shifts into Reverse gear

01 = Inhibit shifts into Reverse gear, and shift transmission to Neutral if already in Reverse or attempting to shift to Reverse

10 = Reserved

11 = Take no action

Data Length:            2 bits

Resolution:            4 states/2 bit, 0 offset

Data Range:            0 to 3

Operational Range: same as data range

Type:                    Status

Supporting Information:

PGN reference:        256

**SPN 4246      *Transmission Mode 5***

Indicates whether transmission mode 5 is enabled. Modes are manufacturer specific and are not necessarily mutually exclusive. See also SPN 4250.

00 Disable

01 Enable

10 Reserved

11 Take no action

Data Length:            2 bits

Resolution:            4 states/2 bit, 0 offset

Data Range:            0 to 3

Operational Range: same as data range

Type:                    Status

Supporting Information:

PGN reference:        256

**SPN 4247      Transmission Mode 6**

Indicates whether transmission mode 6 is enabled. Modes are manufacturer specific and are not necessarily mutually exclusive. See also SPN 4251.

00 Disable  
01 Enable  
10 Reserved  
11 Take no action

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        256

Operational Range: same as data range

**SPN 4248      Transmission Mode 7**

Indicates whether transmission mode 7 is enabled. Modes are manufacturer specific and are not necessarily mutually exclusive. See also SPN 4252.

00 Disable  
01 Enable  
10 Reserved  
11 Take no action

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        256

Operational Range: same as data range

**SPN 4249      Transmission Mode 8**

Indicates whether transmission mode 8 is enabled. Modes are manufacturer specific and are not necessarily mutually exclusive. See also SPN 4253.

00 Disable  
01 Enable  
10 Reserved  
11 Take no action

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        256

Operational Range: same as data range



**SPN 4250      *Transmission Mode 5 Indicator***

Indicates whether transmission mode 5 is enabled. Modes are manufacturer specific and are not necessarily mutually exclusive. See also SPN 4246.

00 Disable  
01 Enable  
10 Reserved  
11 Take no action

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65098

Operational Range: same as data range

**SPN 4251      *Transmission Mode 6 Indicator***

Indicates whether transmission mode 6 is enabled. Modes are manufacturer specific and are not necessarily mutually exclusive. See also SPN 4247.

00 Disable  
01 Enable  
10 Reserved  
11 Take no action

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65098

Operational Range: same as data range

**SPN 4252      *Transmission Mode 7 Indicator***

Indicates whether transmission mode 7 is enabled. Modes are manufacturer specific and are not necessarily mutually exclusive. See also SPN 4248.

00 Disable  
01 Enable  
10 Reserved  
11 Take no action

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65098

Operational Range: same as data range

**SPN 4253      *Transmission Mode 8 Indicator***

Indicates whether transmission mode 8 is enabled. Modes are manufacturer specific and are not necessarily mutually exclusive. See also SPN 4249.

00 Disable  
01 Enable  
10 Reserved  
11 Take no action

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65098

Operational Range: same as data range

***(R) SPN 4254      Transmission Mode Label***

Conveys ASCII 'labels' for each of the manufacturer-specified TC1 Transmission Mode 'x' / ETC7 Transmission Mode Indicator 'x' pairs. Intended for use with on-board or service tool displays.

NOTE – Non-printable or non-graphic ASCII characters are not allowed, and the ASCII character "\*" is reserved as a delimiter

Data Length:            Variable - up to 25 bytes followed by an "\*" delimiter  
Resolution:            ASCII, 0 offset  
Data Range:            0 to 255 per byte  
Type:                    Measured  
Supporting Information: See Appendix D - PGN 64839  
PGN reference:        64839

Operational Range: same as data range

**SPN 4255      *Transmission Requested Launch Gear***

Initial gear for the transmission to start out in when the vehicle is launched from a standing stop, as specified by the vehicle operator or vehicle system. Automatic transmissions typically default to starting out in 1st gear. However, in applications such as those with very low gearing, it is desirable to launch the vehicle in a range higher than 1st. For example, when the vehicle has little or no payload, the operator may wish to launch from 2nd or 3rd gear to avoid stacked, unnecessary shifts in the lower ranges.

0000 = No specific launch gear requested; use default launch gear

0001 = Launch the vehicle in 1st gear

0010 = Launch the vehicle in 2nd gear

0011 = Launch the vehicle in 3rd gear

0100 = Launch the vehicle in 4th gear

0101 = Launch the vehicle in 5th gear

0110 = Launch the vehicle in 6th gear

0111 = Launch the vehicle in 7th gear

1000 = Launch the vehicle in 8th gear

1001 = Launch the vehicle in Reverse 1

1010 = Launch the vehicle in Reverse 2

1011 = Launch the vehicle in Reverse 3

1100 = Launch the vehicle in Reverse 4

1101 = Reserved

1110 = Error

1111 = Not Available

Data Length:            4 bits

Resolution:            16 states/4 bit, 0 offset

Data Range:            0 to 15

Type:                    Measured

Supporting Information:

PGN reference:        256

Operational Range: same as data range

**SPN 4261      *Transmission Reverse Gear Shift Inhibit Status***

Reflects the status of transmission reverse inhibit activity in response to requests via SPN 4242 - Transmission Reverse Gear Shift Inhibit Request. Typically broadcast by the transmission controller.

00 = Reverse gear shifts are currently allowed

01 = Reverse gear shifts are currently inhibited

10 = Error

11 = Not Available

Data Length:            2 bits

Resolution:            4 states/2 bit, 0 offset

Data Range:            0 to 3

Type:                    Measured

Supporting Information:

PGN reference:        65098

Operational Range: same as data range

=====  
=====

**SPN 4287      Engine Exhaust Valve Actuation System Oil Pressure**

The absolute pressure of the oil in the hydraulic system that powers the engine exhaust valve actuation system

|                         |                         |                                       |
|-------------------------|-------------------------|---------------------------------------|
| Data Length:            | 2 bytes                 |                                       |
| Resolution:             | 1/256 MPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 251 MPa            | Operational Range: same as data range |
| Type:                   | Measured                |                                       |
| Supporting Information: |                         |                                       |
| PGN reference:          | 64961                   |                                       |

**SPN 4288      Engine Exhaust Valve Actuation System Oil Temperature**

The temperature of the oil in the hydraulic system that powers the engine exhaust valve actuation system

|                         |                                      |                                       |
|-------------------------|--------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                              |                                       |
| Resolution:             | 0.03125 deg C/bit, -273 deg C offset |                                       |
| Data Range:             | -273 to 1734.96875 deg C             | Operational Range: same as data range |
| Type:                   | Measured                             |                                       |
| Supporting Information: |                                      |                                       |
| PGN reference:          | 64870                                |                                       |

**SPN 4289      Aftertreatment 1 Three Way Catalytic Converter Intake Gas Temperature**

Temperature of engine combustion byproducts entering the Three Way Catalytic Converter in exhaust bank 1.

|                         |                                      |                                       |
|-------------------------|--------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                              |                                       |
| Resolution:             | 0.03125 deg C/bit, -273 deg C offset |                                       |
| Data Range:             | -273 to 1734.96875 deg C             | Operational Range: same as data range |
| Type:                   | Measured                             |                                       |
| Supporting Information: |                                      |                                       |
| PGN reference:          | 64838                                |                                       |

**SPN 4290      Aftertreatment 1 Three Way Catalytic Converter Outlet Gas Temperature**

Temperature of engine combustion byproducts leaving the Three Way Catalytic Converter in exhaust bank 1.

|                         |                                      |                                       |
|-------------------------|--------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                              |                                       |
| Resolution:             | 0.03125 deg C/bit, -273 deg C offset |                                       |
| Data Range:             | -273 to 1734.96875 deg C             | Operational Range: same as data range |
| Type:                   | Measured                             |                                       |
| Supporting Information: |                                      |                                       |
| PGN reference:          | 64838                                |                                       |

**SPN 4291      *Aftertreatment 1 Three Way Catalytic Converter Differential Pressure***

Exhaust differential pressure measured between the intake and exhaust of a Three Way Catalytic Converter in exhaust bank 1.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64838                 |                                       |

**SPN 4292      *Aftertreatment 1 Three Way Catalytic Converter Intake Gas Temperature Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the Three Way Catalytic Converter intake gas temperature sensor by the manufacturer's sensor control software in exhaust bank 1. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Measured         |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 64838            |                                       |

**SPN 4293      *Aftertreatment 1 Three Way Catalytic Converter Outlet Gas Temperature Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the Three Way Catalytic Converter outlet gas temperature sensor by the manufacturer's sensor control software in exhaust bank 1. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Measured         |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 64838            |                                       |

**SPN 4294      *Aftertreatment 1 Three Way Catalytic Converter Differential Pressure Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the Three Way Catalytic Converter differential pressure sensor by the manufacturer's sensor control software in exhaust bank 1. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Measured         |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 64838            |                                       |

**SPN 4295**      ***Aftertreatment 2 Three Way Catalytic Converter Intake Gas Temperature***

Temperature of engine combustion byproducts entering the Three Way Catalytic Converter in exhaust bank 2.

(For a single exhaust bank system, refer to parameters in PGN AT1TWCC.)

|                         |                                      |                                       |
|-------------------------|--------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                              |                                       |
| Resolution:             | 0.03125 deg C/bit, -273 deg C offset |                                       |
| Data Range:             | -273 to 1734.96875 deg C             | Operational Range: same as data range |
| Type:                   | Measured                             |                                       |
| Supporting Information: |                                      |                                       |
| PGN reference:          | 64837                                |                                       |

**SPN 4296**      ***Aftertreatment 2 Three Way Catalytic Converter Outlet Gas Temperature***

Temperature of engine combustion byproducts leaving the Three Way Catalytic Converter in exhaust bank 2.

(For a single exhaust bank system, refer to parameters in PGN AT1TWCC.)

|                         |                                      |                                       |
|-------------------------|--------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                              |                                       |
| Resolution:             | 0.03125 deg C/bit, -273 deg C offset |                                       |
| Data Range:             | -273 to 1734.96875 deg C             | Operational Range: same as data range |
| Type:                   | Measured                             |                                       |
| Supporting Information: |                                      |                                       |
| PGN reference:          | 64837                                |                                       |

**SPN 4297**      ***Aftertreatment 2 Three Way Catalytic Converter Differential Pressure***

Exhaust differential pressure measured between the intake and exhaust of a Three Way Catalytic Converter in exhaust bank 2.

(For a single exhaust bank system, refer to parameters in PGN AT1TWCC.)

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64837                 |                                       |

**SPN 4298      *Aftertreatment 2 Three Way Catalytic Converter Intake Gas Temperature Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the Three Way Catalytic Converter intake gas temperature sensor by the manufacturer's sensor control software in exhaust bank 2. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

(For a single exhaust bank system, refer to parameters in PGN AT1TWCC.)

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Measured         |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 64837            |                                       |

**SPN 4299      *Aftertreatment 2 Three Way Catalytic Converter Outlet Gas Temperature Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the Three Way Catalytic Converter outlet gas temperature sensor by the manufacturer's sensor control software in exhaust bank 2. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

(For a single exhaust bank system, refer to parameters in PGN AT1TWCC.)

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Measured         |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 64837            |                                       |

**SPN 4300      *Aftertreatment 2 Three Way Catalytic Converter Differential Pressure Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the Three Way Catalytic Converter differential pressure sensor by the manufacturer's sensor control software in exhaust bank 2. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

(For a single exhaust bank system, refer to parameters in PGN AT1TWCC.)

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Measured         |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 64837            |                                       |

**SPN 4301      *Aftertreatment 1 Fuel Injector 1 Heater Control***

Heating level that the controller is commanding the aftertreatment 1 fuel injector 1 heater control to maintain. 0% = off, 100% = maximum.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Status              |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64929               |                                       |

**SPN 4302      *Aftertreatment 2 Fuel Injector 1 Heater Control***

Heating level that the controller is commanding the aftertreatment 2 fuel injector 1 heater control to maintain. 0% = off, 100% = maximum.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Status              |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64928               |                                       |

**SPN 4303      *Aftertreatment 2 Fuel Pressure 2***

Second fuel pressure measurement for the aftertreatment 2 system.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64836                 |                                       |

**SPN 4304      *ECU Manufacturer Name***

The name of the manufacturer of the physical ECU.

This name may be different than the manufacturer identified by the Manufacturer Code (SPN 2838) and listed in table B10 of J1939.

|                         |                                                        |                                       |
|-------------------------|--------------------------------------------------------|---------------------------------------|
| Data Length:            | Variable - up to 200 bytes followed by an "" delimiter |                                       |
| Resolution:             | ASCII, 0 offset                                        |                                       |
| Data Range:             | 0 to 255 per byte                                      | Operational Range: same as data range |
| Type:                   | Measured                                               |                                       |
| Supporting Information: |                                                        |                                       |
| PGN reference:          | 64965                                                  |                                       |



**SPN 4331      *Aftertreatment 1 SCR Actual Dosing Reagent Quantity***

Actual reducing agent quantity of SCR-system

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 2 bytes                   |                                       |
| Resolution:             | 0.3 g/h per bit, 0 offset |                                       |
| Data Range:             | 0 to 19276.5 g/h          | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 61475                     |                                       |

**(R) SPN 4332      *Aftertreatment 1 SCR System State***

Actual state of SCR system

|           |                                                                          |
|-----------|--------------------------------------------------------------------------|
| 0000      | Dormant (sleep mode)                                                     |
| 0001      | Preparing dosing readiness (wake up; prepare to operate; wait for start) |
| 0010      | Normal dosing operation                                                  |
| 0011      | System error pending                                                     |
| 0100      | Reserved for future assignment by SAE                                    |
| 0101      | Protect mode against heat (pressure buildup)                             |
| 0110      | Protect mode against cold (defreeze)                                     |
| 0111      | Shutoff (wait for afterrun)                                              |
| 1000      | Diagnosis (afterrun)                                                     |
| 1001      | Service test mode, dosing allowed                                        |
| 1010      | Service test mode, dosing not allowed                                    |
| 1011-1101 | Reserved for future assignment by SAE                                    |
| 1110      | Error                                                                    |
| 1111      | Not available                                                            |

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 61475                     |                                       |

**SPN 4333      *Aftertreatment 1 SCR Actual Reagent Quantity of Integrator***

The SCR requested reagent integrator total quantity for aftertreatment system 1 (exhaust bank 1).

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 2 bytes                   |                                       |
| Resolution:             | 0.10 g/bit, 0 offset      |                                       |
| Data Range:             | 0 to 6425.5 g             | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: | See Appendix D - SPN 1761 |                                       |
| PGN reference:          | 61475                     |                                       |

**SPN 4334      *Aftertreatment 1 SCR Dosing Reagent Absolute Pressure***

The SCR dosing reagent absolute pressure (measured closest to dosing valve) for aftertreatment system 1 (exhaust bank 1).

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 1 byte                    |                                       |
| Resolution:             | 8 kPa/bit, 0 offset       |                                       |
| Data Range:             | 0 to 2,000 kPa            | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: | See Appendix D - SPN 1761 |                                       |
| PGN reference:          | 61475                     |                                       |

**SPN 4335      *Aftertreatment 1 SCR Dosing Air Assist Absolute Pressure***

The SCR dosing system air assist absolute pressure for aftertreatment system 1 (exhaust bank 1). The air assist system is used to improve the dosed reagent atomization.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 1 byte                    |                                       |
| Resolution:             | 8 kPa/bit, 0 offset       |                                       |
| Data Range:             | 0 to 2,000 kPa            | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: | See Appendix D - SPN 1761 |                                       |
| PGN reference:          | 64833                     |                                       |

**SPN 4336      *Aftertreatment 1 SCR Dosing Air Assist Valve***

The position of the valve used to regulate the air supply of an air assist SCR dosing system for an engine. 0% represents no supply and 100% is full supply.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 1 byte                    |                                       |
| Resolution:             | 0.4 %/bit, 0 offset       |                                       |
| Data Range:             | 0 to 100 %                | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: | See Appendix D - SPN 1761 |                                       |
| PGN reference:          | 64833                     |                                       |

**SPN 4337      *Aftertreatment 1 SCR Dosing Reagent Temperature***

The SCR dosing reagent temperature (measured closest to dosing valve) for aftertreatment system 1 (exhaust bank 1).

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 deg C/bit, -40 deg C offset |                                       |
| Data Range:             | -40 to 210 deg C              | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: | See Appendix D - SPN 1761     |                                       |
| PGN reference:          | 64833                         |                                       |

**SPN 4338      *Aftertreatment 1 SCR Dosing Valve Exhaust Temp. Reduction Request***

Protection request for the dosing valve of the SCR-system to prevent overheating

000: no request  
001: reduction request stage 1  
010: reduction request stage 2  
011: reserved for future assignment by SAE  
100: reserved for future assignment by SAE  
101: reserved for future assignment by SAE  
110: error  
111: not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 3 bits                   |                                       |
| Resolution:             | 8 states/3 bit, 0 offset |                                       |
| Data Range:             | 0 to 7                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64833                    |                                       |

**SPN 4339      *Aftertreatment 1 SCR Feedback Control Status***

The SCR feedback control status (open/closed loop) for aftertreatment system 1 (exhaust bank 1).

000 open loop control active  
001 closed loop control active  
010 reserved for future assignment by SAE  
011 reserved for future assignment by SAE  
100 reserved for future assignment by SAE  
101 reserved for future assignment by SAE  
110 error  
111 not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 3 bits                   |                                       |
| Resolution:             | 8 states/3 bit, 0 offset |                                       |
| Data Range:             | 0 to 7                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64833                    |                                       |

**SPN 4340      *Aftertreatment 1 SCR Catalyst Reagent Line Heater 1 state***

The SCR catalyst reagent line heater 1 state for aftertreatment system 1 (exhaust bank 1).

00 heater inactive  
01 heater active  
10 error  
11 not available

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 2 bits                    |                                       |
| Resolution:             | 4 states/2 bit, 0 offset  |                                       |
| Data Range:             | 0 to 3                    | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: | See Appendix D - SPN 1761 |                                       |
| PGN reference:          | 64833                     |                                       |

**SPN 4341      *Aftertreatment 1 SCR Catalyst Reagent Line Heater 1 Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the SCR catalyst reagent line heater 1, by the manufacturer's control software in exhaust bank 1. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 64833            |                                       |

**SPN 4342      *Aftertreatment 1 SCR Catalyst Reagent Line Heater 2 state***

The SCR catalyst reagent line heater 2 state for aftertreatment system 1 (exhaust bank 1).

00 heater inactive  
01 heater active  
10 error  
11 not available

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 2 bits                    |                                       |
| Resolution:             | 4 states/2 bit, 0 offset  |                                       |
| Data Range:             | 0 to 3                    | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: | See Appendix D - SPN 1761 |                                       |
| PGN reference:          | 64833                     |                                       |

**SPN 4343      *Aftertreatment 1 SCR Catalyst Reagent Line Heater 2 Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the SCR catalyst reagent line heater 2, by the manufacturer's control software in exhaust bank 1. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 64833            |                                       |

**SPN 4344      *Aftertreatment 1 SCR Catalyst Reagent Line Heater 3 state***

The SCR catalyst reagent line heater 3 state for aftertreatment system 1 (exhaust bank 1).

00 heater inactive  
01 heater active  
10 error  
11 not available

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 2 bits                    |                                       |
| Resolution:             | 4 states/2 bit, 0 offset  |                                       |
| Data Range:             | 0 to 3                    | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: | See Appendix D - SPN 1761 |                                       |
| PGN reference:          | 64833                     |                                       |

**SPN 4345      *Aftertreatment 1 SCR Catalyst Reagent Line Heater 3 Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the SCR catalyst reagent line heater 3, by the manufacturer's control software in exhaust bank 1. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 64833            |                                       |

**SPN 4346      *Aftertreatment 1 SCR Catalyst Reagent Line Heater 4 state***

The SCR catalyst reagent line heater 4 state for aftertreatment system 1 (exhaust bank 1).

00 heater inactive  
01 heater active  
10 error  
11 not available

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 2 bits                    |                                       |
| Resolution:             | 4 states/2 bit, 0 offset  |                                       |
| Data Range:             | 0 to 3                    | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: | See Appendix D - SPN 1761 |                                       |
| PGN reference:          | 64833                     |                                       |

**SPN 4347      *Aftertreatment 1 SCR Catalyst Reagent Line Heater 4 Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the SCR catalyst reagent line heater 4, by the manufacturer's control software in exhaust bank 1. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 64833            |                                       |

**SPN 4348      *Aftertreatment 1 SCR Requested Dosing Reagent Quantity***

Actual requested dosing quantity of catalyst reagent

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 2 bytes                   |                                       |
| Resolution:             | 0.3 g/h per bit, 0 offset |                                       |
| Data Range:             | 0 to 19276.5 g/h          | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 61476                     |                                       |

**SPN 4349      *Aftertreatment 1 SCR System Requested State***

Requested state of SCR system for aftertreatment system 1 (exhaust bank 1).

0000 Dormant (sleep mode)  
0001 Preparing dosing readiness (wake up; prepare to operate; wait for start)  
0010 Normal dosing operation  
0011 System error pending  
0100 Reserved for future assignment by SAE  
0101 Protect mode against heat (pressure buildup)  
0110 Protect mode against cold (defreeze)  
0111 Shutoff (wait for afterrun)  
1000 Diagnosis (afterrun)  
1001 Service test mode, dosing allowed  
1010 Service test mode, dosing not allowed  
1011-1101 Reserved for future assignment by SAE  
1110 Error  
1111 Not available

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 61476                     |                                       |

**SPN 4350      *Aftertreatment 1 SCR Requested Reagent Quantity for Integrator***

Represents the command for the reducing agent quantity integrator in the dosing control unit

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 2 bytes                   |                                       |
| Resolution:             | 0.10 g/bit, 0 offset      |                                       |
| Data Range:             | 0 to 6425.5 g             | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: | See Appendix D - SPN 1761 |                                       |
| PGN reference:          | 61476                     |                                       |

**SPN 4352      *Aftertreatment 1 SCR Doser Fault Suppression Request***

Used if external devices can warn of conditions that require suppression of potential faults in the doser due to environmental conditions.

00 Error suppression off  
01 Error suppression on  
10 Reserved  
11 Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64832                    |                                       |

**SPN 4353      *Aftertreatment 1 SCR Doser Heating Mode Request***

Used if multiple heater modes are available in the Doser.

000 Heater off  
001 Heater economy mode  
010 Heater automatic mode  
011 Heater on  
100 - 110 Reserved  
111 Not available

Data Length: 3 bits  
Resolution: 8 states/3 bit, 0 offset  
Data Range: 0 to 7  
Type: Status  
Supporting Information:  
PGN reference: 64832

Operational Range: same as data range

**SPN 4354      *Aftertreatment 1 SCR Catalyst Reagent Line Heater 1***

The SCR catalyst reagent line heater 1 request for aftertreatment system 1 (exhaust bank 1).

00 request for heater to be inactive  
01 request for heater to be active  
10 reserved for future assignment by SAE  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information: See Appendix D - SPN 1761  
PGN reference: 64832

Operational Range: same as data range

**SPN 4355      *Aftertreatment 1 SCR Catalyst Reagent Line Heater 2***

The SCR catalyst reagent line heater 2 request for aftertreatment system 1 (exhaust bank 1).

00 request for heater to be inactive  
01 request for heater to be active  
10 reserved for future assignment by SAE  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information: See Appendix D - SPN 1761  
PGN reference: 64832

Operational Range: same as data range



**SPN 4356      *Aftertreatment 1 SCR Catalyst Reagent Line Heater 3***

The SCR catalyst reagent line heater 3 request for aftertreatment system 1 (exhaust bank 1).

00 request for heater to be inactive  
01 request for heater to be active  
10 reserved for future assignment by SAE  
11 not available

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 2 bits                    |                                       |
| Resolution:             | 4 states/2 bit, 0 offset  |                                       |
| Data Range:             | 0 to 3                    | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: | See Appendix D - SPN 1761 |                                       |
| PGN reference:          | 64832                     |                                       |

**SPN 4357      *Aftertreatment 1 SCR Catalyst Reagent Line Heater 4***

The SCR catalyst reagent line heater 4 request for aftertreatment system 1 (exhaust bank 1).

00 request for heater to be inactive  
01 request for heater to be active  
10 reserved for future assignment by SAE  
11 not available

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 2 bits                    |                                       |
| Resolution:             | 4 states/2 bit, 0 offset  |                                       |
| Data Range:             | 0 to 3                    | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: | See Appendix D - SPN 1761 |                                       |
| PGN reference:          | 64832                     |                                       |

**SPN 4358      *Aftertreatment 1 SCR Catalyst Exhaust Gas Differential Pressure***

Exhaust differential pressure measured between the intake and exhaust of a SCR catalyst in exhaust bank 1.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 2 bytes                   |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset     |                                       |
| Data Range:             | 0 to 6,425.5 kPa          | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: | See Appendix D - SPN 1761 |                                       |
| PGN reference:          | 64831                     |                                       |

**SPN 4359      *Aftertreatment 1 SCR Catalyst Exhaust Gas Differential Pressure Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the SCR catalyst differential pressure sensor by the manufacturer's sensor control software in exhaust bank 1. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 5 bits                    |                                       |
| Resolution:             | 32 states/5 bit, 0 offset |                                       |
| Data Range:             | 0 to 31                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64831                     |                                       |

**SPN 4360      *Aftertreatment 1 SCR Catalyst Intake Gas Temperature***

Temperature of engine combustion byproducts entering the SCR catalyst in exhaust bank 1.

|                         |                                      |                                       |
|-------------------------|--------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                              |                                       |
| Resolution:             | 0.03125 deg C/bit, -273 deg C offset |                                       |
| Data Range:             | -273 to 1734.96875 deg C             | Operational Range: same as data range |
| Type:                   | Measured                             |                                       |
| Supporting Information: | See Appendix D - SPN 1761            |                                       |
| PGN reference:          | 64830                                |                                       |

**SPN 4361      *Aftertreatment 1 SCR Catalyst Intake Gas Temperature Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the SCR catalyst intake gas temperature sensor by the manufacturer's sensor control software in exhaust bank 1. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 5 bits                    |                                       |
| Resolution:             | 32 states/5 bit, 0 offset |                                       |
| Data Range:             | 0 to 31                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64830                     |                                       |

**SPN 4362      *Aftertreatment 1 SCR Catalyst Outlet Gas Temperature Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the SCR catalyst outlet gas temperature sensor by the manufacturer's sensor control software in exhaust bank 1. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 5 bits                    |                                       |
| Resolution:             | 32 states/5 bit, 0 offset |                                       |
| Data Range:             | 0 to 31                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64830                     |                                       |

**SPN 4363      *Aftertreatment 1 SCR Catalyst Outlet Gas Temperature***

Temperature of engine combustion byproducts leaving the SCR catalyst exhaust in exhaust bank 1.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information: See Appendix D - SPN 1761  
PGN reference: 64830

**(R) SPN 4364      *Aftertreatment 1 SCR Catalyst Conversion Efficiency***

The SCR catalyst conversion efficiency percentage. Calculated as 100 times the catalyst intake NOx minus the catalyst outlet NOx divided by the catalyst intake NOx. The catalyst conversion efficiency number in itself does not imply emissions compliance or system function or system malfunction.

Data Length: 1 byte  
Resolution: 0.4 %/bit, 0 offset  
Data Range: 0 to 100 %      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 64878

**SPN 4365      *Aftertreatment 1 SCR Catalyst Reagent Tank 1 Temperature Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the SCR catalyst reagent tank 1 temperature, by the manufacturer's control software in exhaust bank 1. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

Data Length: 5 bits  
Resolution: Binary, 0 offset  
Data Range: 0 to 31      Operational Range: same as data range  
Type: Status  
Supporting Information:  
PGN reference: 65110

**SPN 4366      *Aftertreatment 1 SCR Catalyst Reagent Tank 1 Heater Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the SCR catalyst reagent tank 1 heater, by the manufacturer's control software in exhaust bank 1. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

Data Length: 5 bits  
Resolution: Binary, 0 offset  
Data Range: 0 to 31      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 65110

**SPN 4367      *Aftertreatment 1 SCR Catalyst Reagent Tank 2 Level***

The SCR catalyst reagent tank 2 level percentage for aftertreatment system 1 (exhaust bank 1). 0% is empty and 100% is full. Tank 2 is used as a quick thaw reagent tank.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 1 byte                    |                                       |
| Resolution:             | 0.4 %/bit, 0 offset       |                                       |
| Data Range:             | 0 to 100 %                | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: | See Appendix D - SPN 1761 |                                       |
| PGN reference:          | 64829                     |                                       |

**SPN 4368      *Aftertreatment 1 SCR Catalyst Reagent Tank 2 Temperature***

The SCR catalyst reagent tank 2 temperature for aftertreatment system 1 (exhaust bank 1). Tank 2 is used as a quick thaw reagent tank.

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 deg C/bit, -40 deg C offset |                                       |
| Data Range:             | -40 to 210 deg C              | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: | See Appendix D - SPN 1761     |                                       |
| PGN reference:          | 64829                         |                                       |

**SPN 4369      *Aftertreatment 1 SCR Catalyst Reagent Tank 2 Level 2***

The SCR catalyst reagent tank 2 level height in mm for aftertreatment system 1 (exhaust bank 1). Tank 2 is used as a quick thaw reagent tank.

|                         |                                 |                                       |
|-------------------------|---------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                         |                                       |
| Resolution:             | 0.1 mm/bit, 0 offset            |                                       |
| Data Range:             | 0 to 6,425.5 mm (0 to 6.4255 m) | Operational Range: same as data range |
| Type:                   | Status                          |                                       |
| Supporting Information: | See Appendix D - SPN 1761       |                                       |
| PGN reference:          | 64829                           |                                       |

**SPN 4370      *Aftertreatment 1 SCR Catalyst Reagent Tank 2 Level Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the SCR catalyst reagent tank 2 level, by the manufacturer's control software in exhaust bank 1. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 64829            |                                       |

**SPN 4371      *Aftertreatment 1 SCR Reagent Tank 2 Temperature Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the SCR catalyst reagent tank 2 temperature, by the manufacturer's control software in exhaust bank 1. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 64829            |                                       |

**(R) SPN 4372      *Aftertreatment 1 SCR Catalyst Reagent Tank 2 Heater***

The SCR catalyst reagent tank 2 heater percentage for aftertreatment system 1 (exhaust bank 1). 0% is off. See SPN 5414 for the command for this tank heater.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 1 byte                    |                                       |
| Resolution:             | 0.4 %/bit, 0 offset       |                                       |
| Data Range:             | 0 to 100 %                | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: | See Appendix D - SPN 1761 |                                       |
| PGN reference:          | 64829                     |                                       |

**SPN 4373      *Aftertreatment 1 SCR Catalyst Reagent Tank 2 Heater Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the SCR catalyst reagent tank 2 heater, by the manufacturer's control software in exhaust bank 1. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 64829            |                                       |

**SPN 4374      *Aftertreatment 1 SCR Catalyst Reagent Pump Motor Speed***

Rotational speed of the motor driving a pump for reagent used in an aftertreatment system.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 2 bytes                   |                                       |
| Resolution:             | 0.5 rpm/bit, 0 offset     |                                       |
| Data Range:             | 0 to 32,127.5 rpm         | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: | See Appendix D - SPN 1761 |                                       |
| PGN reference:          | 64828                     |                                       |

**SPN 4375      *Aftertreatment 1 SCR Catalyst Reagent Pump Drive Percentage***

The percent (command) sent to the motor to control the speed of the reagent pump.

Data Length: 1 byte  
Resolution: 0.4 %/bit, 0 offset  
Data Range: 0 to 100 %      Operational Range: same as data range  
Type: Status  
Supporting Information: See Appendix D - SPN 1761  
PGN reference: 64828

**SPN 4376      *Aftertreatment 1 SCR Catalyst Reagent Return Valve***

Command to the valve which determines whether the reagent is delivered to the injector or is routed back to the reagent tank. Zero directs all reagent flow to the injector, 100% sends all reagent back to the tank.

Data Length: 1 byte  
Resolution: 0.4 %/bit, 0 offset  
Data Range: 0 to 100 %      Operational Range: same as data range  
Type: Status  
Supporting Information: See Appendix D - SPN 1761  
PGN reference: 64828

**SPN 4377      *Aftertreatment 1 Outlet NH3***

The amount of NH3 in the exhaust exiting the aftertreatment system measured by a NH3 sensor at the aftertreatment outlet, represented in NH3 molecule parts per million non-NH3 molecules in exhaust bank 1.

Data Length: 2 bytes  
Resolution: 0.3 g/h per bit, 0 offset  
Data Range: 0 to 19276.5 g/h      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 61477

**SPN 4378      *Aftertreatment 1 Outlet NH3 Sensor Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the aftertreatment outlet NH3 sensor by the manufacturer's sensor control software in exhaust bank 1. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

Data Length: 5 bits  
Resolution: Binary, 0 offset  
Data Range: 0 to 31      Operational Range: same as data range  
Type: Status  
Supporting Information:  
PGN reference: 61477

**SPN 4379      *Aftertreatment 1 Outlet NH3 Reading Stable***

Indicates that the NH3 reading of the aftertreatment outlet NH3 sensor is stable as determined by the manufacturer's control software in exhaust bank 1.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61477                    |                                       |

**SPN 4380      *Aftertreatment 1 Outlet NH3 Gas Sensor Power In Range***

Indicates that the power supplied to the aftertreatment outlet NH3 gas sensor is within the manufacturer's specification in exhaust bank 1.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61477                    |                                       |

**SPN 4381      *Aftertreatment 1 Outlet NH3 Gas Sensor at Temperature***

Indicates that the heater element of the aftertreatment outlet NH3 gas sensor is within the manufacturer's specified range for accurate measurements in exhaust bank 1.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61477                    |                                       |

**SPN 4382      *Aftertreatment 1 Outlet NH3 Gas Sensor Heater Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the heater of the outlet NH3 exhaust gas sensor by the manufacturer's sensor control software in exhaust bank 1. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 61477            |                                       |

**SPN 4383      *Aftertreatment 1 Outlet NH3 Gas Sensor Heater Control***

Indicates the heater status in the warm-up process. Upon receiving a power-up command, the NH3 gas sensor ramps up according to a manufacturer defined profile. The Preheat 1, Preheat 2, and Automatic messages are regions within this profile in exhaust bank 1.

00 - Automatic

01 - Preheat 2

10 - Preheat 1

11 - Heater off or not available

Data Length:            2 bits

Resolution:            4 states/2 bit, 0 offset

Data Range:            0 to 3

Type:                    Status

Supporting Information:

PGN reference:        61477

Operational Range: same as data range

**SPN 4384      *Aftertreatment 2 SCR Actual Dosing Reagent Quantity***

Actual reducing agent quantity of SCR system.

Data Length:            2 bytes

Resolution:            0.3 g/h per bit, 0 offset

Data Range:            0 to 19276.5 g/h

Type:                    Measured

Supporting Information:

PGN reference:        61478

Operational Range: same as data range

**(R) SPN 4385      *Aftertreatment 2 SCR System State***

Actual state of SCR system

0000 Dormant (sleep mode)

0001 Preparing dosing readiness (wake up; prepare to operate; wait for start)

0010 Normal dosing operation

0011 System error pending

0100 Reserved for future assignment by SAE

0101 Protect mode against heat (pressure buildup)

0110 Protect mode against cold (defreeze)

0111 Shutoff (wait for afterrun)

1000 Diagnosis (afterrun)

1001 Service test mode, dosing allowed

1010 Service test mode, dosing not allowed

1011-1101 Reserved for future assignment by SAE

1110 Error

1111 Not available

Data Length:            4 bits

Resolution:            16 states/4 bit, 0 offset

Data Range:            0 to 15

Type:                    Status

Supporting Information:

PGN reference:        61478

Operational Range: same as data range



**SPN 4386      *Aftertreatment 2 SCR Actual Reagent Quantity of Integrator***

The SCR requested reagent integrator total quantity for aftertreatment system 2 (exhaust bank 2).

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 2 bytes              |                                       |
| Resolution:             | 0.10 g/bit, 0 offset |                                       |
| Data Range:             | 0 to 6425.5 g        | Operational Range: same as data range |
| Type:                   | Measured             |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 61478                |                                       |

**SPN 4387      *Aftertreatment 2 SCR Dosing Reagent Absolute Pressure***

The SCR dosing reagent absolute pressure (measured closest to dosing valve) for aftertreatment system 2 (exhaust bank 2).

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 8 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 2,000 kPa      | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 61478               |                                       |

**SPN 4388      *Aftertreatment 2 SCR Dosing Air Assist Absolute Pressure***

The SCR dosing system air assist absolute pressure for aftertreatment system 2 (exhaust bank 2). The air assist system is used to improve the dosed reagent atomization.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 8 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 2,000 kPa      | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64827               |                                       |

**SPN 4389      *Aftertreatment 2 SCR Dosing Air Assist Valve***

The position of the valve used to regulate the air supply of an air assist SCR dosing system for an engine. 0% represents no supply and 100% is full supply.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Status              |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64827               |                                       |

**SPN 4390      *Aftertreatment 2 SCR Dosing Reagent Temperature***

The SCR dosing reagent temperature (measured closest to dosing valve) for aftertreatment system 2 (exhaust bank 2).

Data Length: 1 byte  
Resolution: 1 deg C/bit, -40 deg C offset  
Data Range: -40 to 210 deg C  
Type: Measured  
Supporting Information:  
PGN reference: 64827

Operational Range: same as data range

**SPN 4391      *Aftertreatment 2 SCR Dosing Valve Exhaust Temp. Reduction Request***

Protection request for the dosing valve of the SCR-system to prevent overheating

000: no request  
001: reduction request stage 1  
010: reduction request stage 2  
011: reserved for future assignment by SAE  
100: reserved for future assignment by SAE  
101: reserved for future assignment by SAE  
110: error  
111: not available

Data Length: 3 bits  
Resolution: 8 states/3 bit, 0 offset  
Data Range: 0 to 7  
Type: Status  
Supporting Information:  
PGN reference: 64827

Operational Range: same as data range

**SPN 4392      *Aftertreatment 2 SCR Feedback Control Status***

The SCR feedback control status (open/closed loop) for aftertreatment system 2 (exhaust bank 2).

000 open loop control active  
001 closed loop control active  
010 reserved for future assignment by SAE  
011 reserved for future assignment by SAE  
100 reserved for future assignment by SAE  
101 reserved for future assignment by SAE  
110 error  
111 not available

Data Length: 3 bits  
Resolution: 8 states/3 bit, 0 offset  
Data Range: 0 to 7  
Type: Status  
Supporting Information:  
PGN reference: 64827

Operational Range: same as data range

**SPN 4393      *Aftertreatment 2 SCR Catalyst Reagent Line Heater 1 state***

The SCR catalyst reagent line heater 1 state for aftertreatment system 2 (exhaust bank 2).

00 heater inactive  
01 heater active  
10 error  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 64827

Operational Range: same as data range

**SPN 4394      *Aftertreatment 2 SCR Catalyst Reagent Line Heater 1 Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the SCR catalyst reagent line heater 1, by the manufacturer's control software in exhaust bank 2. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

Data Length: 5 bits  
Resolution: Binary, 0 offset  
Data Range: 0 to 31  
Type: Status  
Supporting Information:  
PGN reference: 64827

Operational Range: same as data range

**SPN 4395      *Aftertreatment 2 SCR Catalyst Reagent Line Heater 2 state***

The SCR catalyst reagent line heater 2 state for aftertreatment system 2 (exhaust bank 2).

00 heater inactive  
01 heater active  
10 error  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 64827

Operational Range: same as data range

**SPN 4396      *Aftertreatment 2 SCR Catalyst Reagent Line Heater 2 Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the SCR catalyst reagent line heater 2, by the manufacturer's control software in exhaust bank 2. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 64827            |                                       |

**SPN 4397      *Aftertreatment 2 SCR Catalyst Reagent Line Heater 3 state***

The SCR catalyst reagent line heater 3 state for aftertreatment system 2 (exhaust bank 2).

00 heater inactive  
01 heater active  
10 error  
11 not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64827                    |                                       |

**SPN 4398      *Aftertreatment 2 SCR Catalyst Reagent Line Heater 3 Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the SCR catalyst reagent line heater 3, by the manufacturer's control software in exhaust bank 2. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 64827            |                                       |

**SPN 4399      *Aftertreatment 2 SCR Catalyst Reagent Line Heater 4 state***

The SCR catalyst reagent line heater 4 state for aftertreatment system 2 (exhaust bank 2).

00 heater inactive  
01 heater active  
10 error  
11 not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64827                    |                                       |

**SPN 4400      *Aftertreatment 2 SCR Catalyst Reagent Line Heater 4 Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the SCR catalyst reagent line heater 4, by the manufacturer's control software in exhaust bank 2. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 64827            |                                       |

**SPN 4401      *Aftertreatment 2 SCR Requested Dosing Reagent Quantity***

Actual requested dosing quantity of catalyst reagent

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 2 bytes                   |                                       |
| Resolution:             | 0.3 g/h per bit, 0 offset |                                       |
| Data Range:             | 0 to 19276.5 g/h          | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 61479                     |                                       |

**SPN 4402      *Aftertreatment 2 SCR System Requested State***

Requested state of SCR system for aftertreatment system 2 (exhaust bank 2).

0000 Dormant (sleep mode)  
0001 Preparing dosing readiness (wake up; prepare to operate; wait for start)  
0010 Normal dosing operation  
0011 System error pending  
0100 Reserved for future assignment by SAE  
0101 Protect mode against heat (pressure buildup)  
0110 Protect mode against cold (defreeze)  
0111 Shutoff (wait for afterrun)  
1000 Diagnosis (afterrun)  
1001 Service test mode, dosing allowed  
1010 Service test mode, dosing not allowed  
1011-1101 Reserved for future assignment by SAE  
1110 Error  
1111 Not available

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 61479                     |                                       |

**SPN 4403      *Aftertreatment 2 SCR Requested Reagent Quantity for Integrator***

Represents the command for the reducing agent quantity integrator in the dosing control unit

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 2 bytes              |                                       |
| Resolution:             | 0.10 g/bit, 0 offset |                                       |
| Data Range:             | 0 to 6425.5 g        | Operational Range: same as data range |
| Type:                   | Measured             |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 61479                |                                       |

**SPN 4405      *Aftertreatment 2 SCR Doser Fault Suppression Request***

Used if external devices can warn of conditions that require suppression of potential faults in the doser due to environmental conditions.

00 Error suppression off  
01 Error suppression on  
10 Reserved  
11 Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64826                    |                                       |

**SPN 4406      *Aftertreatment 2 SCR Doser Heating Mode Request***

Used if multiple heater modes are available in the Doser.

000 Heater off  
001 Heater economy mode  
010 Heater automatic mode  
011 Heater on  
100 - 110 Reserved  
111 Not available

Data Length: 3 bits  
Resolution: 8 states/3 bit, 0 offset  
Data Range: 0 to 7  
Type: Status  
Supporting Information:  
PGN reference: 64826

Operational Range: same as data range

**SPN 4407      *Aftertreatment 2 SCR Catalyst Reagent Line Heater 1***

The SCR catalyst reagent line heater 1 request for aftertreatment system 2 (exhaust bank 2).

00 request for heater to be inactive  
01 request for heater to be active  
10 reserved for future assignment by SAE  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 64826

Operational Range: same as data range

**SPN 4408      *Aftertreatment 2 SCR Catalyst Reagent Line Heater 2***

The SCR catalyst reagent line heater 2 request for aftertreatment system 2 (exhaust bank 2).

00 request for heater to be inactive  
01 request for heater to be active  
10 reserved for future assignment by SAE  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 64826

Operational Range: same as data range

**SPN 4409      *Aftertreatment 2 SCR Catalyst Reagent Line Heater 3***

The SCR catalyst reagent line heater 3 request for aftertreatment system 2 (exhaust bank 2).

00 request for heater to be inactive  
01 request for heater to be active  
10 reserved for future assignment by SAE  
11 not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64826                    |                                       |

**SPN 4410      *Aftertreatment 2 SCR Catalyst Reagent Line Heater 4***

The SCR catalyst reagent line heater 4 request for aftertreatment system 2 (exhaust bank 2).

00 request for heater to be inactive  
01 request for heater to be active  
10 reserved for future assignment by SAE  
11 not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64826                    |                                       |

**SPN 4411      *Aftertreatment 2 SCR Catalyst Exhaust Gas Differential Pressure***

Exhaust differential pressure measured between the intake and exhaust of a SCR catalyst in exhaust bank 2.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64825                 |                                       |



**SPN 4412      *Aftertreatment 2 SCR Catalyst Exhaust Gas Differential Pressure Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the SCR catalyst differential pressure sensor by the manufacturer's sensor control software in exhaust bank 2. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 5 bits                    |                                       |
| Resolution:             | 32 states/5 bit, 0 offset |                                       |
| Data Range:             | 0 to 31                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64825                     |                                       |

**SPN 4413      *Aftertreatment 2 SCR Catalyst Intake Gas Temperature***

Temperature of engine combustion byproducts entering the SCR catalyst in exhaust bank 2.

|                         |                                      |                                       |
|-------------------------|--------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                              |                                       |
| Resolution:             | 0.03125 deg C/bit, -273 deg C offset |                                       |
| Data Range:             | -273 to 1734.96875 deg C             | Operational Range: same as data range |
| Type:                   | Measured                             |                                       |
| Supporting Information: |                                      |                                       |
| PGN reference:          | 64824                                |                                       |

**SPN 4414      *Aftertreatment 2 SCR Catalyst Intake Gas Temperature Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the SCR catalyst intake gas temperature sensor by the manufacturer's sensor control software in exhaust bank 2. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 5 bits                    |                                       |
| Resolution:             | 32 states/5 bit, 0 offset |                                       |
| Data Range:             | 0 to 31                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64824                     |                                       |

**SPN 4415      *Aftertreatment 2 SCR Catalyst Outlet Gas Temperature***

Temperature of engine combustion byproducts leaving the SCR catalyst exhaust in exhaust bank 2.

|                         |                                      |                                       |
|-------------------------|--------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                              |                                       |
| Resolution:             | 0.03125 deg C/bit, -273 deg C offset |                                       |
| Data Range:             | -273 to 1734.96875 deg C             | Operational Range: same as data range |
| Type:                   | Measured                             |                                       |
| Supporting Information: |                                      |                                       |
| PGN reference:          | 64824                                |                                       |

**SPN 4416      *Aftertreatment 2 SCR Catalyst Outlet Gas Temperature Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the SCR catalyst outlet gas temperature sensor by the manufacturer's sensor control software in exhaust bank 2. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 5 bits                    |                                       |
| Resolution:             | 32 states/5 bit, 0 offset |                                       |
| Data Range:             | 0 to 31                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64824                     |                                       |

**SPN 4417      *Aftertreatment 2 SCR Average Catalyst Reagent Consumption***

Measured use of reagent by a Selective Catalytic Reduction system for exhaust emission control, averaged over the previous 15 hours of engine operation. Used to determine whether the SCR system is using an appropriate amount of reagent, by comparing with the Commanded Reagent Consumption parameter (SPN 4418).

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bytes                    |                                       |
| Resolution:             | 0.05 L/h per bit, 0 offset |                                       |
| Data Range:             | 0 to 3,212.75 L/h          | Operational Range: same as data range |
| Type:                   | Measured                   |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 64823                      |                                       |

**SPN 4418      *Aftertreatment 2 SCR Commanded Catalyst Reagent Consumption***

This parameter transmits the amount of reagent that the emissions control system has requested to be used, averaged over the past 15 hours of engine operation. Used to determine whether the SCR system is using an appropriate amount of reagent, by comparing with the Average Reagent Consumption parameter (SPN 4417).

|                         |                            |                                       |
|-------------------------|----------------------------|---------------------------------------|
| Data Length:            | 2 bytes                    |                                       |
| Resolution:             | 0.05 L/h per bit, 0 offset |                                       |
| Data Range:             | 0 to 3,212.75 L/h          | Operational Range: same as data range |
| Type:                   | Status                     |                                       |
| Supporting Information: |                            |                                       |
| PGN reference:          | 64823                      |                                       |

**(R) SPN 4419      *Aftertreatment 2 SCR Catalyst Conversion Efficiency***

The SCR catalyst conversion efficiency percentage. Calculated as 100 times the catalyst intake NO<sub>x</sub> minus the catalyst outlet NO<sub>x</sub> divided by the catalyst intake NO<sub>x</sub>. The catalyst conversion efficiency number in itself does not imply emissions compliance or system function or system malfunction.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64823               |                                       |

**SPN 4420      *Aftertreatment 2 SCR Catalyst Reagent Temperature 2***

Temperature of the catalyst reagent at the device measuring reagent quality

Data Length: 1 byte  
Resolution: 1 deg C/bit, -40 deg C offset  
Data Range: -40 to 210 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 64822

**SPN 4421      *Aftertreatment 2 SCR Catalyst Reagent Concentration***

A measure of the concentration of urea in water. Zero percent means that the tank contains no urea. A 32.5% value indicates that the reagent is of the proper concentration. The 32.5% value indicates that the concentration is highest quality.

Data Length: 1 byte  
Resolution: 0.25 %/bit, 0 offset  
Data Range: 0 to 62.5 %      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 64822

**SPN 4422      *Aftertreatment 2 SCR Catalyst Reagent Conductivity***

A measure of the conductivity of the reagent or fluid at the sensor. The conductivity is an indication of the reagent's chemical make up.

Data Length: 1 byte  
Resolution: 5 microSiemens/mm, 0 offset  
Data Range: 0 to 1250 microSiemens/mm      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 64822

**SPN 4423      *Aftertreatment 2 SCR Catalyst Reagent Temperature 2 Preliminary FMI***

Used to identify the applicable J1939-73 FMI that applies to the most significant failure of the catalyst temperature sensor. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

Data Length: 5 bits  
Resolution: Binary, 0 offset  
Data Range: 0 to 31      Operational Range: same as data range  
Type: Status  
Supporting Information:  
PGN reference: 64822

**SPN 4424      *Aftertreatment 2 SCR Catalyst Reagent Properties Preliminary FMI***

Used to identify the applicable J1939-73 FMI that applies to the most significant failure of the catalyst reagent properties sensor. This may be used for indicating failures of the catalyst reagent concentration, catalyst reagent conductivity or

catalyst reagent type. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 64822            |                                       |

#### **SPN 4425      *Aftertreatment 2 SCR Catalyst Reagent Type***

This parameter indicates what reagent is in the tank. A value of 0011 indicates uncontaminated Diesel Exhaust Fluid.

0000 - Catalyst reagent is urea concentration too high  
0001 - Catalyst reagent is urea concentration too low  
0010 - Catalyst reagent is diesel  
0011 - Catalyst reagent is proper mixture  
0101 to 1100 - Reserved for SAE assignment  
1101 - Not able to determine catalyst reagent type (type unknown)  
1110 - Error detected with urea reagent type detection  
1111 - Not available

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64822                     |                                       |

#### **SPN 4426      *Aftertreatment 2 SCR Catalyst Tank Level***

A special catalyst uses chemical substance to reach legal requirement for NOX emissions. This parameter indicates the level within that catalyst tank.

0 % = Empty  
100% = Full

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64821               |                                       |

**SPN 4427      *Aftertreatment 2 SCR Catalyst Tank Temperature***

Temperature of the reagent in the storage tank.

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 deg C/bit, -40 deg C offset |                                       |
| Data Range:             | -40 to 210 deg C              | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          | 64821                         |                                       |

**SPN 4428      *Aftertreatment 2 SCR Catalyst Tank Level 2***

The measure of the reagent level in the catalyst tank.

|                         |                                 |                                       |
|-------------------------|---------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                         |                                       |
| Resolution:             | 0.1 mm/bit, 0 offset            |                                       |
| Data Range:             | 0 to 6,425.5 mm (0 to 6.4255 m) | Operational Range: same as data range |
| Type:                   | Measured                        |                                       |
| Supporting Information: |                                 |                                       |
| PGN reference:          | 64821                           |                                       |

**SPN 4429      *Aftertreatment 2 SCR Catalyst Tank Level Preliminary FMI***

Used to identify the applicable J1939-73 FMI that applies to the most significant failure of the catalyst tank level sensor. This FMI is applicable to either the catalyst tank level 1 or catalyst tank level 2 parameters.

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 64821            |                                       |

**SPN 4430      *Aftertreatment 2 SCR Catalyst Reagent Tank 1 Temperature Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the SCR catalyst reagent tank 1 temperature, by the manufacturer's control software in exhaust bank 2. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 64821            |                                       |

**(R) SPN 4431      *Aftertreatment 2 SCR Catalyst Tank Heater***

Percentage of heating applied to the aftertreatment 2 catalyst tank heater. A value of 0% means no heating applied, a value of 100% means full heating applied. The catalyst tank heater warms the catalyst reagent in the catalyst tank. See SPN 5138 for the command for this tank heater.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64821               |                                       |

**SPN 4432      *Aftertreatment 2 SCR Catalyst Reagent Tank 1 Heater Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the SCR catalyst reagent tank 1 heater, by the manufacturer's control software in exhaust bank 2. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Measured         |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 64821            |                                       |

**SPN 4433      *Aftertreatment 2 SCR Catalyst Reagent Tank 2 Level***

The SCR catalyst reagent tank 2 level percentage for aftertreatment system 2 (exhaust bank 2). 0% is empty and 100% is full. Tank 2 is used as a quick thaw reagent tank.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64820               |                                       |

**SPN 4434      *Aftertreatment 2 SCR Catalyst Reagent Tank 2 Temperature***

The SCR catalyst reagent tank 2 temperature for aftertreatment system 2 (exhaust bank 2). Tank 2 is used as a quick thaw reagent tank.

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 deg C/bit, -40 deg C offset |                                       |
| Data Range:             | -40 to 210 deg C              | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          | 64820                         |                                       |

**SPN 4435      *Aftertreatment 2 SCR Catalyst Reagent Tank 2 Level 2***

The SCR catalyst reagent tank 2 level height in mm for aftertreatment system 2 (exhaust bank 2). Tank 2 is used as a quick thaw reagent tank.

Data Length: 2 bytes  
Resolution: 0.1 mm/bit, 0 offset  
Data Range: 0 to 6,425.5 mm (0 to 6.4255 m)      Operational Range: same as data range  
Type: Status  
Supporting Information:  
PGN reference: 64820

**SPN 4436      *Aftertreatment 2 SCR Catalyst Reagent Tank 2 Level Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the SCR catalyst reagent tank 2 level, by the manufacturer's control software in exhaust bank 2. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

Data Length: 5 bits  
Resolution: Binary, 0 offset  
Data Range: 0 to 31      Operational Range: same as data range  
Type: Status  
Supporting Information:  
PGN reference: 64820

**SPN 4437      *Aftertreatment 2 SCR Reagent Tank 2 Temperature Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the SCR catalyst reagent tank 2 temperature, by the manufacturer's control software in exhaust bank 2. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

Data Length: 5 bits  
Resolution: Binary, 0 offset  
Data Range: 0 to 31      Operational Range: same as data range  
Type: Status  
Supporting Information:  
PGN reference: 64820

**(R) SPN 4438      *Aftertreatment 2 SCR Catalyst Reagent Tank 2 Heater***

The SCR catalyst reagent tank 2 heater percentage for aftertreatment system 1 (exhaust bank 1). 0% is off. See SPN 5415 for the command for this tank heater.

Data Length: 4 bits  
Resolution: 16 states/4 bit, 0 offset  
Data Range: 0 to 15      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 64820

**SPN 4439      *Aftertreatment 2 SCR Catalyst Reagent Tank 2 Heater Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the SCR catalyst reagent tank 2 heater, by the manufacturer's control software in exhaust bank 2. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 64820            |                                       |

**SPN 4440      *Aftertreatment 2 SCR Catalyst Reagent Pump Motor Speed***

Rotational speed of the motor driving a pump for reagent used in an aftertreatment system.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.5 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 32,127.5 rpm     | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64819                 |                                       |

**SPN 4441      *Aftertreatment 2 SCR Catalyst Reagent Pump Drive Percentage***

The percent (command) sent to the motor to control the speed of the reagent pump.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Status              |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64819               |                                       |

**SPN 4442      *Aftertreatment 2 SCR Catalyst Reagent Return Valve***

Command to the valve which determines whether the reagent is delivered to the injector or is routed back to the reagent tank. Zero directs all reagent flow to the injector, 100% sends all reagent back to the tank.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Status              |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64819               |                                       |



**SPN 4443      *Aftertreatment 2 Outlet NH3***

The amount of NH3 in the exhaust exiting the aftertreatment system measured by a NH3 sensor at the aftertreatment outlet, represented in NH3 molecule parts per million non-NH3 molecules in exhaust bank 2.

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 2 bytes                   |                                       |
| Resolution:             | 0.3 g/h per bit, 0 offset |                                       |
| Data Range:             | 0 to 19276.5 g/h          | Operational Range: same as data range |
| Type:                   | Measured                  |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 61480                     |                                       |

**SPN 4444      *Aftertreatment 2 Outlet NH3 Sensor Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the aftertreatment outlet NH3 sensor by the manufacturer's sensor control software in exhaust bank 2. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 61480            |                                       |

**SPN 4445      *Aftertreatment 2 Outlet NH3 Reading Stable***

Indicates that the NH3 reading of the aftertreatment outlet NH3 sensor is stable as determined by the manufacturer's control software in exhaust bank 2.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61480                    |                                       |

**SPN 4446      *Aftertreatment 2 Outlet NH3 Gas Sensor Power In Range***

Indicates that the power supplied to the aftertreatment outlet NH3 gas sensor is within the manufacturer's specification in exhaust bank 2.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61480                    |                                       |

**SPN 4447      *Aftertreatment 2 Outlet NH3 Gas Sensor at Temperature***

Indicates that the heater element of the aftertreatment outlet NH3 gas sensor is within the manufacturer's specified range for accurate measurements in exhaust bank 2.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61480                    |                                       |

**SPN 4448      *Aftertreatment 2 Outlet NH3 Gas Sensor Heater Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the heater of the outlet NH3 exhaust gas sensor by the manufacturer's sensor control software in exhaust bank 2. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 61480            |                                       |

**SPN 4449      *Aftertreatment 2 Outlet NH3 Gas Sensor Heater Control***

Indicates the heater status in the warm-up process. Upon receiving a power-up command, the NH3 gas sensor ramps up according to a manufacturer defined profile. The Preheat 1, Preheat 2, and Automatic messages are regions within this profile in exhaust bank 1.

00 - Automatic  
01 - Preheat 2  
10 - Preheat 1  
11 - Heater off or Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61480                    |                                       |

**SPN 4454      *Retract Status of ramp 4***

Retract status of ramp at doorway 4, counting from front to back on the vehicle.

00 ramp retracted  
01 ramp extended  
10 error  
11 not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64880

Operational Range: same as data range

**SPN 4455      *Enable status of ramp 4***

Enable status of ramp at doorway 4, counting from front to back on the vehicle.

00 ramp disabled  
01 ramp enabled  
10 error  
11 not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64880

Operational Range: same as data range

**SPN 4456      *Movement status of ramp 4***

Movement status of ramp at doorway 4, counting from front to back on the vehicle.

00 ramp not being moved  
01 ramp being moved  
10 error  
11 not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64880

Operational Range: same as data range

**SPN 4457      *Retract Status of ramp 5***

Retract status of ramp at doorway 5, counting from front to back on the vehicle.

00 ramp retracted  
01 ramp extended  
10 error  
11 not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64880

Operational Range: same as data range

**SPN 4458      *Enable status of ramp 5***

Enable status of ramp at doorway 5, counting from front to back on the vehicle.

00 ramp disabled  
01 ramp enabled  
10 error  
11 not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64880

Operational Range: same as data range

**SPN 4459      *Movement status of ramp 5***

Movement status of ramp at doorway 5, counting from front to back on the vehicle.

00 ramp not being moved  
01 ramp being moved  
10 error  
11 not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64880

Operational Range: same as data range

**SPN 4460                    Joystick 1 Lamp 1 Command**

Tells joystick 1 to switch on/off/blinking lamp 1.

00 - Off  
01 - On  
10 - Blinking  
11 - Not available or not installed

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        39168

Operational Range: same as data range

**SPN 4461                    Joystick 1 Lamp 2 Command**

Tells joystick 1 to switch on/off/blinking lamp 2.

00 - Off  
01 - On  
10 - Blinking  
11 - Not available or not installed

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        39168

Operational Range: same as data range

**SPN 4462                    Joystick 1 Lamp 3 Command**

Tells joystick 1 to switch on/off/blinking lamp 3.

00 - Off  
01 - On  
10 - Blinking  
11 - Not available or not installed

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        39168

Operational Range: same as data range

**SPN 4463      Joystick 1 Lamp 4 Command**

Tells joystick 1 to switch on/off/blinking lamp 4.

00 - Off  
01 - On  
10 - Blinking  
11 - Not available or not installed

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        39168

Operational Range: same as data range

**SPN 4464      Joystick 1 Lamp 5 Command**

Tells joystick 1 to switch on/off/blinking lamp 5.

00 - Off  
01 - On  
10 - Blinking  
11 - Not available or not installed

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        39168

Operational Range: same as data range

**SPN 4465      Joystick 1 Lamp 6 Command**

Tells joystick 1 to switch on/off/blinking lamp 6.

00 - Off  
01 - On  
10 - Blinking  
11 - Not available or not installed

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        39168

Operational Range: same as data range

**SPN 4466                    Joystick 1 Lamp 7 Command**

Tells joystick 1 to switch on/off/blinking lamp 7.

00 - Off  
01 - On  
10 - Blinking  
11 - Not available or not installed

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        39168

Operational Range: same as data range

**SPN 4467                    Joystick 1 Lamp 8 Command**

Tells joystick 1 to switch on/off/blinking lamp 8.

00 - Off  
01 - On  
10 - Blinking  
11 - Not available or not installed

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        39168

Operational Range: same as data range

**SPN 4468                    Joystick 1 Lamp 9 Command**

Tells joystick 1 to switch on/off/blinking lamp 9.

00 - Off  
01 - On  
10 - Blinking  
11 - Not available or not installed

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        39168

Operational Range: same as data range

**SPN 4469      Joystick 1 Lamp 10 Command**

Tells joystick 1 to switch on/off/blinking lamp 10.

00 - Off  
01 - On  
10 - Blinking  
11 - Not available or not installed

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        39168

Operational Range: same as data range

**SPN 4470      Joystick 2 Lamp 1 Command**

Tells joystick 2 to switch on/off/blinking lamp 1.

00 - Off  
01 - On  
10 - Blinking  
11 - Not available or not installed

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        39168

Operational Range: same as data range

**SPN 4471      Joystick 2 Lamp 2 Command**

Tells joystick 2 to switch on/off/blinking lamp 2.

00 - Off  
01 - On  
10 - Blinking  
11 - Not available or not installed

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        39168

Operational Range: same as data range



**SPN 4472      Joystick 2 Lamp 3 Command**

Tells joystick 2 to switch on/off/blinking lamp 3.

00 - Off  
01 - On  
10 - Blinking  
11 - Not available or not installed

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        39168

Operational Range: same as data range

**SPN 4473      Joystick 2 Lamp 4 Command**

Tells joystick 2 to switch on/off/blinking lamp 4.

00 - Off  
01 - On  
10 - Blinking  
11 - Not available or not installed

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        39168

Operational Range: same as data range

**SPN 4474      Joystick 2 Lamp 5 Command**

Tells joystick 2 to switch on/off/blinking lamp 5.

00 - Off  
01 - On  
10 - Blinking  
11 - Not available or not installed

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        39168

Operational Range: same as data range

**SPN 4475      Joystick 2 Lamp 6 Command**

Tells joystick 2 to switch on/off/blinking lamp 6.

00 - Off  
01 - On  
10 - Blinking  
11 - Not available or not installed

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        39168

Operational Range: same as data range

**SPN 4476      Joystick 2 Lamp 7 Command**

Tells joystick 2 to switch on/off/blinking lamp 7.

00 - Off  
01 - On  
10 - Blinking  
11 - Not available or not installed

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        39168

Operational Range: same as data range

**SPN 4477      Joystick 2 Lamp 8 Command**

Tells joystick 2 to switch on/off/blinking lamp 8.

00 - Off  
01 - On  
10 - Blinking  
11 - Not available or not installed

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        39168

Operational Range: same as data range

**SPN 4478      Joystick 2 Lamp 9 Command**

Tells joystick 2 to switch on/off/blinking lamp 9.

00 - Off  
01 - On  
10 - Blinking  
11 - Not available or not installed

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        39168

Operational Range: same as data range

**SPN 4479      Joystick 2 Lamp 10 Command**

Tells joystick 2 to switch on/off/blinking lamp 10.

00 - Off  
01 - On  
10 - Blinking  
11 - Not available or not installed

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        39168

Operational Range: same as data range

**SPN 4480      Joystick 3 Lamp 1 Command**

Tells joystick 3 to switch on/off/blinking lamp 1.

00 - Off  
01 - On  
10 - Blinking  
11 - Not available or not installed

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        39168

Operational Range: same as data range

**SPN 4481      Joystick 3 Lamp 2 Command**

Tells joystick 3 to switch on/off/blinking lamp 2.

00 - Off  
01 - On  
10 - Blinking  
11 - Not available or not installed

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        39168

Operational Range: same as data range

**SPN 4482      Joystick 3 Lamp 3 Command**

Tells joystick 3 to switch on/off/blinking lamp 3.

00 - Off  
01 - On  
10 - Blinking  
11 - Not available or not installed

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        39168

Operational Range: same as data range

**SPN 4483      Joystick 3 Lamp 4 Command**

Tells joystick 3 to switch on/off/blinking lamp 4.

00 - Off  
01 - On  
10 - Blinking  
11 - Not available or not installed

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        39168

Operational Range: same as data range

-----

**SPN 4484      Joystick 3 Lamp 5 Command**

Tells joystick 3 to switch on/off/blinking lamp 5.

00 - Off  
01 - On  
10 - Blinking  
11 - Not available or not installed

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        39168

Operational Range: same as data range

**SPN 4485      Joystick 3 Lamp 6 Command**

Tells joystick 3 to switch on/off/blinking lamp 6.

00 - Off  
01 - On  
10 - Blinking  
11 - Not available or not installed

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        39168

Operational Range: same as data range

**SPN 4486      Joystick 3 Lamp 7 Command**

Tells joystick 3 to switch on/off/blinking lamp 7.

00 - Off  
01 - On  
10 - Blinking  
11 - Not available or not installed

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        39168

Operational Range: same as data range

**SPN 4487      Joystick 3 Lamp 8 Command**

Tells joystick 3 to switch on/off/blinking lamp 8.

00 - Off  
01 - On  
10 - Blinking  
11 - Not available or not installed

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        39168

Operational Range: same as data range

**SPN 4488      Joystick 3 Lamp 9 Command**

Tells joystick 3 to switch on/off/blinking lamp 9.

00 - Off  
01 - On  
10 - Blinking  
11 - Not available or not installed

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        39168

Operational Range: same as data range

**SPN 4489      Joystick 3 Lamp 10 Command**

Tells joystick 3 to switch on/off/blinking lamp 10.

00 - Off  
01 - On  
10 - Blinking  
11 - Not available or not installed

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        39168

Operational Range: same as data range

**SPN 4490      *Specific Humidity***

Specific humidity of the ambient intake air.

|                         |                             |                                       |
|-------------------------|-----------------------------|---------------------------------------|
| Data Length:            | 2 bytes                     |                                       |
| Resolution:             | 0.01 g/kg per bit, 0 offset |                                       |
| Data Range:             | 0 to 642.55 g/kg            | Operational Range: same as data range |
| Type:                   | Measured                    |                                       |
| Supporting Information: |                             |                                       |
| PGN reference:          | 64992                       |                                       |

**SPN 4491      *Joystick 4 X-Axis Neutral Position Status***

Reports when the current joystick position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64816                    |                                       |

**SPN 4492      *Joystick 4 X-Axis Lever Left Negative Position Status***

Reports when the current joystick position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64816                    |                                       |

**SPN 4493      Joystick 4 X-Axis Lever Right Positive Position Status**

Reports when the current joystick position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64816

Operational Range: same as data range

**SPN 4494      Joystick 4 X-Axis Position**

The position of the joystick in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

Data Length: 10 bits  
Resolution: 0.1 %/bit, 0 offset  
Data Range: 0 to 102 %  
Type: Measured  
Supporting Information:  
PGN reference: 64816

Operational Range: same as data range

**SPN 4495      Joystick 4 Y-Axis Neutral Position Status**

Reports when the current joystick position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64816

Operational Range: same as data range



**SPN 4496      Joystick 4 Y-Axis Lever Back Negative Position Status**

Reports when the current joystick position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64816                    |                                       |

**SPN 4497      Joystick 4 Y-Axis Lever Forward Positive Position Status**

Reports when the current joystick position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64816                    |                                       |

**SPN 4498      Joystick 4 Y-Axis Position**

The position of the joystick in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 10 bits             |                                       |
| Resolution:             | 0.1 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 102 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64816               |                                       |

**SPN 4499      Joystick 4 Y-Axis Detent Position Status**

Reports when the current joystick position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64816

Operational Range: same as data range

**SPN 4500      Joystick 4 X-Axis Detent Position Status**

Reports when the current joystick position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64816

Operational Range: same as data range

**SPN 4501      Joystick 4 Button 4 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64816

Operational Range: same as data range

**SPN 4502      Joystick 4 Button 3 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64816

Operational Range: same as data range

**SPN 4503      Joystick 4 Button 2 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64816

Operational Range: same as data range

**SPN 4504      Joystick 4 Button 1 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64816

Operational Range: same as data range

**SPN 4505      Joystick 4 Button 8 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64816

Operational Range: same as data range

**SPN 4506      Joystick 4 Button 7 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64816

Operational Range: same as data range

**SPN 4507      Joystick 4 Button 6 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64816

Operational Range: same as data range

**SPN 4508      Joystick 4 Button 5 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64816

Operational Range: same as data range

**SPN 4509      Joystick 4 Button 12 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64816

Operational Range: same as data range

**SPN 4510      Joystick 4 Button 11 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64816

Operational Range: same as data range

**SPN 4511      Joystick 4 Button 10 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64816

Operational Range: same as data range

**SPN 4512      Joystick 4 Button 9 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64816

Operational Range: same as data range

**SPN 4513      Joystick 4 Grip X-Axis Neutral Position Status**

Reports when the current joystick grip position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64815

Operational Range: same as data range

**SPN 4514      Joystick 4 Grip X-Axis Lever Left Negative Position Status**

Reports when the current joystick grip position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64815                    |                                       |

**SPN 4515      Joystick 4 Grip X-Axis Lever Right Positive Position Status**

Reports when the current joystick grip position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64815                    |                                       |

**SPN 4516      Joystick 4 Grip X-Axis Position**

The position of the joystick grip in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 10 bits             |                                       |
| Resolution:             | 0.1 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 102 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64815               |                                       |

**SPN 4517      Joystick 4 Grip Y-Axis Neutral Position Status**

Reports when the current joystick grip position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64815                    |                                       |

**SPN 4518      Joystick 4 Grip Y-Axis Lever Back Negative Position Status**

Reports when the current joystick grip position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64815                    |                                       |

**SPN 4519      Joystick 4 Grip Y-Axis Lever Forward Positive Position Status**

Reports when the current joystick grip position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64815                    |                                       |



**SPN 4520      Joystick 4 Grip Y-Axis Position**

The position of the joystick grip in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 10 bits             |                                       |
| Resolution:             | 0.1 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 102 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64815               |                                       |

**SPN 4521      Joystick 4 Theta-Axis Neutral Position Status**

Reports when the current joystick position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64815                    |                                       |

**SPN 4522      Joystick 4 Theta-Axis Counter Clockwise Negative Position Status**

Reports when the current joystick position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64815                    |                                       |

**SPN 4523      Joystick 4 Theta-Axis Clockwise Positive Position Status**

Reports when the current joystick position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64815                    |                                       |

**SPN 4524      Joystick 4 Theta-Axis Position**

The position of the joystick in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 10 bits             |                                       |
| Resolution:             | 0.1 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 102 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64815               |                                       |

**SPN 4525      Joystick 4 Theta-Axis Detent Position Status**

Reports when the current joystick position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64815                    |                                       |

**SPN 4526      Joystick 4 Grip Y-Axis Detent Position Status**

Reports when the current joystick grip position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64815                    |                                       |

**SPN 4527      Joystick 4 Grip X-Axis Detent Position Status**

Reports when the current joystick grip position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64815                    |                                       |

**SPN 4528      Joystick 5 X-Axis Neutral Position Status**

Reports when the current joystick position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64814                    |                                       |

**SPN 4529      Joystick 5 X-Axis Lever Left Negative Position Status**

Reports when the current joystick position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64814                    |                                       |

**SPN 4530      Joystick 5 X-Axis Lever Right Positive Position Status**

Reports when the current joystick position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64814                    |                                       |

**SPN 4531      Joystick 5 X-Axis Position**

The position of the joystick in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 10 bits             |                                       |
| Resolution:             | 0.1 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 102 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64814               |                                       |

**SPN 4532      Joystick 5 Y-Axis Neutral Position Status**

Reports when the current joystick position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64814                    |                                       |

**SPN 4533      Joystick 5 Y-Axis Lever Back Negative Position Status**

Reports when the current joystick position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64814                    |                                       |

**SPN 4534      Joystick 5 Y-Axis Lever Forward Positive Position Status**

Reports when the current joystick position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64814                    |                                       |

**SPN 4535      Joystick 5 Y-Axis Position**

The position of the joystick in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 10 bits             |                                       |
| Resolution:             | 0.1 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 102 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64814               |                                       |

**SPN 4536      Joystick 5 Y-Axis Detent Position Status**

Reports when the current joystick position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64814                    |                                       |

**SPN 4537      Joystick 5 X-Axis Detent Position Status**

Reports when the current joystick position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64814                    |                                       |

**SPN 4538      Joystick 5 Button 4 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64814

Operational Range: same as data range

**SPN 4539      Joystick 5 Button 3 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64814

Operational Range: same as data range

**SPN 4540      Joystick 5 Button 2 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64814

Operational Range: same as data range

**SPN 4541      Joystick 5 Button 1 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64814

Operational Range: same as data range

**SPN 4542      Joystick 5 Button 8 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64814

Operational Range: same as data range

**SPN 4543      Joystick 5 Button 7 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64814

Operational Range: same as data range



**SPN 4544      Joystick 5 Button 6 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64814

Operational Range: same as data range

**SPN 4545      Joystick 5 Button 5 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64814

Operational Range: same as data range

**SPN 4546      Joystick 5 Button 12 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64814

Operational Range: same as data range

**SPN 4547      Joystick 5 Button 11 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64814

Operational Range: same as data range

**SPN 4548      Joystick 5 Button 10 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64814

Operational Range: same as data range

**SPN 4549      Joystick 5 Button 9 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64814

Operational Range: same as data range

**SPN 4550      Joystick 5 Grip X-Axis Neutral Position Status**

Reports when the current joystick grip position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64813                    |                                       |

**SPN 4551      Joystick 5 Grip X-Axis Lever Left Negative Position Status**

Reports when the current joystick grip position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64813                    |                                       |

**SPN 4552      Joystick 5 Grip X-Axis Lever Right Positive Position Status**

Reports when the current joystick grip position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64813                    |                                       |

**SPN 4553      Joystick 5 Grip X-Axis Position**

The position of the joystick grip in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 10 bits             |                                       |
| Resolution:             | 0.1 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 102 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64813               |                                       |

**SPN 4554      Joystick 5 Grip Y-Axis Neutral Position Status**

Reports when the current joystick grip position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64813                    |                                       |

**SPN 4555      Joystick 5 Grip Y-Axis Lever Back Negative Position Status**

Reports when the current joystick grip position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64813                    |                                       |

**SPN 4556      Joystick 5 Grip Y-Axis Lever Forward Positive Position Status**

Reports when the current joystick grip position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64813

Operational Range: same as data range

**SPN 4557      Joystick 5 Grip Y-Axis Position**

The position of the joystick grip in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

Data Length:            10 bits  
Resolution:            0.1 %/bit, 0 offset  
Data Range:            0 to 102 %  
Type:                    Measured  
Supporting Information:  
PGN reference:        64813

Operational Range: same as data range

**SPN 4558      Joystick 5 Theta-Axis Neutral Position Status**

Reports when the current joystick position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64813

Operational Range: same as data range

**SPN 4559      Joystick 5 Theta-Axis Counter Clockwise Negative Position Status**

Reports when the current joystick position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64813                    |                                       |

**SPN 4560      Joystick 5 Theta-Axis Clockwise Positive Position Status**

Reports when the current joystick position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64813                    |                                       |

**SPN 4561      Joystick 5 Theta-Axis Position**

The position of the joystick in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 10 bits             |                                       |
| Resolution:             | 0.1 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 102 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64813               |                                       |

**SPN 4562      Joystick 5 Theta-Axis Detent Position Status**

Reports when the current joystick position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64813                    |                                       |

**SPN 4563      Joystick 5 Grip Y-Axis Detent Position Status**

Reports when the current joystick grip position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64813                    |                                       |

**SPN 4564      Joystick 5 Grip X-Axis Detent Position Status**

Reports when the current joystick grip position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64813                    |                                       |

**SPN 4565      Joystick 6 X-Axis Neutral Position Status**

Reports when the current joystick position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64812

Operational Range: same as data range

**SPN 4566      Joystick 6 X-Axis Lever Left Negative Position Status**

Reports when the current joystick position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64812

Operational Range: same as data range

**SPN 4567      Joystick 6 X-Axis Lever Right Positive Position Status**

Reports when the current joystick position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64812

Operational Range: same as data range



**SPN 4568      Joystick 6 X-Axis Position**

The position of the joystick in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 10 bits             |                                       |
| Resolution:             | 0.1 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 102 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64812               |                                       |

**SPN 4569      Joystick 6 Y-Axis Neutral Position Status**

Reports when the current joystick position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64812                    |                                       |

**SPN 4570      Joystick 6 Y-Axis Lever Back Negative Position Status**

Reports when the current joystick position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64812                    |                                       |

**SPN 4571      Joystick 6 Y-Axis Lever Forward Positive Position Status**

Reports when the current joystick position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64812

Operational Range: same as data range

**SPN 4572      Joystick 6 Y-Axis Position**

The position of the joystick in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

Data Length:            10 bits  
Resolution:            0.1 %/bit, 0 offset  
Data Range:            0 to 102 %  
Type:                    Measured  
Supporting Information:  
PGN reference:        64812

Operational Range: same as data range

**SPN 4573      Joystick 6 Y-Axis Detent Position Status**

Reports when the current joystick position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64812

Operational Range: same as data range

**SPN 4574      Joystick 6 X-Axis Detent Position Status**

Reports when the current joystick position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64812

Operational Range: same as data range

**SPN 4575      Joystick 6 Button 4 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64812

Operational Range: same as data range

**SPN 4576      Joystick 6 Button 3 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64812

Operational Range: same as data range

**SPN 4577      Joystick 6 Button 2 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64812

Operational Range: same as data range

**SPN 4578      Joystick 6 Button 1 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64812

Operational Range: same as data range

**SPN 4579      Joystick 6 Button 8 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64812

Operational Range: same as data range

**SPN 4580      Joystick 6 Button 7 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64812

Operational Range: same as data range

**SPN 4581      Joystick 6 Button 6 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64812

Operational Range: same as data range

**SPN 4582      Joystick 6 Button 5 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64812

Operational Range: same as data range

**SPN 4583      Joystick 6 Button 12 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64812

Operational Range: same as data range

**SPN 4584      Joystick 6 Button 11 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64812

Operational Range: same as data range

**SPN 4585      Joystick 6 Button 10 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64812

Operational Range: same as data range

**SPN 4586      Joystick 6 Button 9 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64812

Operational Range: same as data range

**SPN 4587      Joystick 6 Grip X-Axis Neutral Position Status**

Reports when the current joystick grip position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64811

Operational Range: same as data range

**SPN 4588      Joystick 6 Grip X-Axis Lever Left Negative Position Status**

Reports when the current joystick grip position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64811

Operational Range: same as data range

**SPN 4589      Joystick 6 Grip X-Axis Lever Right Positive Position Status**

Reports when the current joystick grip position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64811

Operational Range: same as data range

**SPN 4590      Joystick 6 Grip X-Axis Position**

The position of the joystick grip in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

Data Length:            10 bits  
Resolution:            0.1 %/bit, 0 offset  
Data Range:            0 to 102 %  
Type:                    Measured  
Supporting Information:  
PGN reference:        64811

Operational Range: same as data range

**SPN 4591      Joystick 6 Grip Y-Axis Neutral Position Status**

Reports when the current joystick grip position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64811

Operational Range: same as data range



**SPN 4592      Joystick 6 Grip Y-Axis Lever Back Negative Position Status**

Reports when the current joystick grip position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64811

Operational Range: same as data range

**SPN 4593      Joystick 6 Grip Y-Axis Lever Forward Positive Position Status**

Reports when the current joystick grip position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64811

Operational Range: same as data range

**SPN 4594      Joystick 6 Grip Y-Axis Position**

The position of the joystick grip in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

Data Length:            10 bits  
Resolution:            0.1 %/bit, 0 offset  
Data Range:            0 to 102 %  
Type:                    Measured  
Supporting Information:  
PGN reference:        64811

Operational Range: same as data range

**SPN 4595      *Joystick 6 Theta-Axis Neutral Position Status***

Reports when the current joystick position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64811                    |                                       |

**SPN 4596      *Joystick 6 Theta-Axis Counter Clockwise Negative Position Status***

Reports when the current joystick position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64811                    |                                       |

**SPN 4597      *Joystick 6 Theta-Axis Clockwise Positive Position Status***

Reports when the current joystick position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64811                    |                                       |

**SPN 4598      Joystick 6 Theta-Axis Position**

The position of the joystick in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 10 bits             |                                       |
| Resolution:             | 0.1 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 102 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64811               |                                       |

**SPN 4599      Joystick 6 Theta-Axis Detent Position Status**

Reports when the current joystick position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64811                    |                                       |

**SPN 4600      Joystick 6 Grip Y-Axis Detent Position Status**

Reports when the current joystick grip position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64811                    |                                       |

**SPN 4601      Joystick 6 Grip X-Axis Detent Position Status**

Reports when the current joystick grip position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64811

Operational Range: same as data range

**SPN 4602      Joystick 7 X-Axis Neutral Position Status**

Reports when the current joystick position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64810

Operational Range: same as data range

**SPN 4603      Joystick 7 X-Axis Lever Left Negative Position Status**

Reports when the current joystick position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64810

Operational Range: same as data range

**SPN 4604      Joystick 7 X-Axis Lever Right Positive Position Status**

Reports when the current joystick position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64810

Operational Range: same as data range

**SPN 4605      Joystick 7 X-Axis Position**

The position of the joystick in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

Data Length:            10 bits  
Resolution:            0.1 %/bit, 0 offset  
Data Range:            0 to 102 %  
Type:                    Measured  
Supporting Information:  
PGN reference:        64810

Operational Range: same as data range

**SPN 4606      Joystick 7 Y-Axis Neutral Position Status**

Reports when the current joystick position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64810

Operational Range: same as data range

**SPN 4607      Joystick 7 Y-Axis Lever Back Negative Position Status**

Reports when the current joystick position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64810

Operational Range: same as data range

**SPN 4608      Joystick 7 Y-Axis Lever Forward Positive Position Status**

Reports when the current joystick position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64810

Operational Range: same as data range

**SPN 4609      Joystick 7 Y-Axis Position**

The position of the joystick in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

Data Length: 10 bits  
Resolution: 0.1 %/bit, 0 offset  
Data Range: 0 to 102 %  
Type: Measured  
Supporting Information:  
PGN reference: 64810

Operational Range: same as data range

**SPN 4610      Joystick 7 Y-Axis Detent Position Status**

Reports when the current joystick position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64810

Operational Range: same as data range

**SPN 4611      Joystick 7 X-Axis Detent Position Status**

Reports when the current joystick position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64810

Operational Range: same as data range

**SPN 4612      Joystick 7 Button 4 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64810

Operational Range: same as data range

**SPN 4613      Joystick 7 Button 3 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64810

Operational Range: same as data range

**SPN 4614      Joystick 7 Button 2 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64810

Operational Range: same as data range

**SPN 4615      Joystick 7 Button 1 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64810

Operational Range: same as data range



**SPN 4616      Joystick 7 Button 8 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64810

Operational Range: same as data range

**SPN 4617      Joystick 7 Button 7 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64810

Operational Range: same as data range

**SPN 4618      Joystick 7 Button 6 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64810

Operational Range: same as data range

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**SPN 4619      Joystick 7 Button 5 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64810

Operational Range: same as data range

**SPN 4620      Joystick 7 Button 12 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64810

Operational Range: same as data range

**SPN 4621      Joystick 7 Button 11 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64810

Operational Range: same as data range

**SPN 4622      Joystick 7 Button 10 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64810

Operational Range: same as data range

**SPN 4623      Joystick 7 Button 9 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64810

Operational Range: same as data range

**SPN 4624      Joystick 7 Grip X-Axis Neutral Position Status**

Reports when the current joystick grip position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64809

Operational Range: same as data range

**SPN 4625      Joystick 7 Grip X-Axis Lever Left Negative Position Status**

Reports when the current joystick grip position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64809	

**SPN 4626      Joystick 7 Grip X-Axis Lever Right Positive Position Status**

Reports when the current joystick grip position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64809	

**SPN 4627      Joystick 7 Grip X-Axis Position**

The position of the joystick grip in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

Data Length:	10 bits	
Resolution:	0.1 %/bit, 0 offset	
Data Range:	0 to 102 %	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64809	

**SPN 4628      Joystick 7 Grip Y-Axis Neutral Position Status**

Reports when the current joystick grip position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64809	

**SPN 4629      Joystick 7 Grip Y-Axis Lever Back Negative Position Status**

Reports when the current joystick grip position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64809	

**SPN 4630      Joystick 7 Grip Y-Axis Lever Forward Positive Position Status**

Reports when the current joystick grip position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64809	

**SPN 4631      Joystick 7 Grip Y-Axis Position**

The position of the joystick grip in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

Data Length:	10 bits	
Resolution:	0.1 %/bit, 0 offset	
Data Range:	0 to 102 %	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64809	

**SPN 4632      Joystick 7 Theta-Axis Neutral Position Status**

Reports when the current joystick position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64809	

**SPN 4633      Joystick 7 Theta-Axis Counter Clockwise Negative Position Status**

Reports when the current joystick position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64809	

**SPN 4634      Joystick 7 Theta-Axis Clockwise Positive Position Status**

Reports when the current joystick position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64809

Operational Range: same as data range

**SPN 4635      Joystick 7 Theta-Axis Position**

The position of the joystick in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

Data Length: 10 bits  
Resolution: 0.1 %/bit, 0 offset  
Data Range: 0 to 102 %  
Type: Measured  
Supporting Information:  
PGN reference: 64809

Operational Range: same as data range

**SPN 4636      Joystick 7 Theta-Axis Detent Position Status**

Reports when the current joystick position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64809

Operational Range: same as data range

**SPN 4637      Joystick 7 Grip Y-Axis Detent Position Status**

Reports when the current joystick grip position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64809

Operational Range: same as data range

**SPN 4638      Joystick 7 Grip X-Axis Detent Position Status**

Reports when the current joystick grip position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64809

Operational Range: same as data range

**SPN 4639      Joystick 8 X-Axis Neutral Position Status**

Reports when the current joystick position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64808

Operational Range: same as data range



**SPN 4640      Joystick 8 X-Axis Lever Left Negative Position Status**

Reports when the current joystick position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64808

Operational Range: same as data range

**SPN 4641      Joystick 8 X-Axis Lever Right Positive Position Status**

Reports when the current joystick position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64808

Operational Range: same as data range

**SPN 4642      Joystick 8 X-Axis Position**

The position of the joystick in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

Data Length: 10 bits  
Resolution: 0.1 %/bit, 0 offset  
Data Range: 0 to 102 %  
Type: Measured  
Supporting Information:  
PGN reference: 64808

Operational Range: same as data range

**SPN 4643      Joystick 8 Y-Axis Neutral Position Status**

Reports when the current joystick position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64808

Operational Range: same as data range

**SPN 4644      Joystick 8 Y-Axis Lever Back Negative Position Status**

Reports when the current joystick position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64808

Operational Range: same as data range

**SPN 4645      Joystick 8 Y-Axis Lever Forward Positive Position Status**

Reports when the current joystick position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64808

Operational Range: same as data range

**SPN 4646      Joystick 8 Y-Axis Position**

The position of the joystick in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

Data Length:	10 bits	
Resolution:	0.1 %/bit, 0 offset	
Data Range:	0 to 102 %	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64808	

**SPN 4647      Joystick 8 Y-Axis Detent Position Status**

Reports when the current joystick position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64808	

**SPN 4648      Joystick 8 X-Axis Detent Position Status**

Reports when the current joystick position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64808	

**SPN 4649      Joystick 8 Button 4 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64808

Operational Range: same as data range

**SPN 4650      Joystick 8 Button 3 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64808

Operational Range: same as data range

**SPN 4651      Joystick 8 Button 2 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64808

Operational Range: same as data range

**SPN 4652      Joystick 8 Button 1 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64808

Operational Range: same as data range

**SPN 4653      Joystick 8 Button 8 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64808

Operational Range: same as data range

**SPN 4654      Joystick 8 Button 7 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64808

Operational Range: same as data range

**SPN 4655      Joystick 8 Button 6 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64808

Operational Range: same as data range

**SPN 4656      Joystick 8 Button 5 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64808

Operational Range: same as data range

**SPN 4657      Joystick 8 Button 12 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64808

Operational Range: same as data range

**SPN 4658      Joystick 8 Button 11 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64808

Operational Range: same as data range

**SPN 4659      Joystick 8 Button 10 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64808

Operational Range: same as data range

**SPN 4660      Joystick 8 Button 9 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64808

Operational Range: same as data range

**SPN 4661      Joystick 8 Grip X-Axis Neutral Position Status**

Reports when the current joystick grip position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64807

Operational Range: same as data range

**SPN 4662      Joystick 8 Grip X-Axis Lever Left Negative Position Status**

Reports when the current joystick grip position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64807

Operational Range: same as data range

**SPN 4663      Joystick 8 Grip X-Axis Lever Right Positive Position Status**

Reports when the current joystick grip position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64807

Operational Range: same as data range



**SPN 4664      Joystick 8 Grip X-Axis Position**

The position of the joystick grip in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

Data Length:	10 bits	
Resolution:	0.1 %/bit, 0 offset	
Data Range:	0 to 102 %	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64807	

**SPN 4665      Joystick 8 Grip Y-Axis Neutral Position Status**

Reports when the current joystick grip position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64807	

**SPN 4666      Joystick 8 Grip Y-Axis Lever Back Negative Position Status**

Reports when the current joystick grip position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64807	

**SPN 4667      Joystick 8 Grip Y-Axis Lever Forward Positive Position Status**

Reports when the current joystick grip position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64807

Operational Range: same as data range

**SPN 4668      Joystick 8 Grip Y-Axis Position**

The position of the joystick grip in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

Data Length: 10 bits  
Resolution: 0.1 %/bit, 0 offset  
Data Range: 0 to 102 %  
Type: Measured  
Supporting Information:  
PGN reference: 64807

Operational Range: same as data range

**SPN 4669      Joystick 8 Theta-Axis Neutral Position Status**

Reports when the current joystick position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64807

Operational Range: same as data range

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**SPN 4670      Joystick 8 Theta-Axis Counter Clockwise Negative Position Status**

Reports when the current joystick position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64807

Operational Range: same as data range

**SPN 4671      Joystick 8 Theta-Axis Clockwise Positive Position Status**

Reports when the current joystick position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64807

Operational Range: same as data range

**SPN 4672      Joystick 8 Theta-Axis Position**

The position of the joystick in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

Data Length: 10 bits  
Resolution: 0.1 %/bit, 0 offset  
Data Range: 0 to 102 %  
Type: Measured  
Supporting Information:  
PGN reference: 64807

Operational Range: same as data range

**SPN 4673      Joystick 8 Theta-Axis Detent Position Status**

Reports when the current joystick position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64807	

**SPN 4674      Joystick 8 Grip Y-Axis Detent Position Status**

Reports when the current joystick grip position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64807	

**SPN 4675      Joystick 8 Grip X-Axis Detent Position Status**

Reports when the current joystick grip position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64807	

**SPN 4676      Joystick 9 X-Axis Neutral Position Status**

Reports when the current joystick position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64806

Operational Range: same as data range

**SPN 4677      Joystick 9 X-Axis Lever Left Negative Position Status**

Reports when the current joystick position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64806

Operational Range: same as data range

**SPN 4678      Joystick 9 X-Axis Lever Right Positive Position Status**

Reports when the current joystick position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64806

Operational Range: same as data range

**SPN 4679      Joystick 9 X-Axis Position**

The position of the joystick in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

Data Length:	10 bits	
Resolution:	0.1 %/bit, 0 offset	
Data Range:	0 to 102 %	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64806	

**SPN 4680      Joystick 9 Y-Axis Neutral Position Status**

Reports when the current joystick position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64806	

**SPN 4681      Joystick 9 Y-Axis Lever Back Negative Position Status**

Reports when the current joystick position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64806	

**SPN 4682      Joystick 9 Y-Axis Lever Forward Positive Position Status**

Reports when the current joystick position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64806

Operational Range: same as data range

**SPN 4683      Joystick 9 Y-Axis Position**

The position of the joystick in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

Data Length:            10 bits  
Resolution:            0.1 %/bit, 0 offset  
Data Range:            0 to 102 %  
Type:                    Measured  
Supporting Information:  
PGN reference:        64806

Operational Range: same as data range

**SPN 4684      Joystick 9 Y-Axis Detent Position Status**

Reports when the current joystick position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64806

Operational Range: same as data range

**SPN 4685      Joystick 9 X-Axis Detent Position Status**

Reports when the current joystick position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64806

Operational Range: same as data range

**SPN 4686      Joystick 9 Button 4 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64806

Operational Range: same as data range

**SPN 4687      Joystick 9 Button 3 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64806

Operational Range: same as data range



**SPN 4688      Joystick 9 Button 2 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64806

Operational Range: same as data range

**SPN 4689      Joystick 9 Button 1 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64806

Operational Range: same as data range

**SPN 4690      Joystick 9 Button 8 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64806

Operational Range: same as data range

**SPN 4691      Joystick 9 Button 7 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64806

Operational Range: same as data range

**SPN 4692      Joystick 9 Button 6 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64806

Operational Range: same as data range

**SPN 4693      Joystick 9 Button 5 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64806

Operational Range: same as data range

**SPN 4694      Joystick 9 Button 12 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64806

Operational Range: same as data range

**SPN 4695      Joystick 9 Button 11 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64806

Operational Range: same as data range

**SPN 4696      Joystick 9 Button 10 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64806

Operational Range: same as data range

**SPN 4697      Joystick 9 Button 9 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64806

Operational Range: same as data range

**SPN 4698      Joystick 9 Grip X-Axis Neutral Position Status**

Reports when the current joystick grip position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64805

Operational Range: same as data range

**SPN 4699      Joystick 9 Grip X-Axis Lever Left Negative Position Status**

Reports when the current joystick grip position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64805

Operational Range: same as data range

**SPN 4700      Joystick 9 Grip X-Axis Lever Right Positive Position Status**

Reports when the current joystick grip position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64805

Operational Range: same as data range

**SPN 4701      Joystick 9 Grip X-Axis Position**

The position of the joystick grip in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

Data Length: 10 bits  
Resolution: 0.1 %/bit, 0 offset  
Data Range: 0 to 102 %  
Type: Measured  
Supporting Information:  
PGN reference: 64805

Operational Range: same as data range

**SPN 4702      Joystick 9 Grip Y-Axis Neutral Position Status**

Reports when the current joystick grip position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64805

Operational Range: same as data range

**SPN 4703      Joystick 9 Grip Y-Axis Lever Back Negative Position Status**

Reports when the current joystick grip position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64805

Operational Range: same as data range

**SPN 4704      Joystick 9 Grip Y-Axis Lever Forward Positive Position Status**

Reports when the current joystick grip position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64805

Operational Range: same as data range

**SPN 4705      Joystick 9 Grip Y-Axis Position**

The position of the joystick grip in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

Data Length: 10 bits  
Resolution: 0.1 %/bit, 0 offset  
Data Range: 0 to 102 %  
Type: Measured  
Supporting Information:  
PGN reference: 64805

Operational Range: same as data range

**SPN 4706      Joystick 9 Theta-Axis Neutral Position Status**

Reports when the current joystick position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64805

Operational Range: same as data range

**SPN 4707      Joystick 9 Theta-Axis Counter Clockwise Negative Position Status**

Reports when the current joystick position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64805

Operational Range: same as data range

**SPN 4708      Joystick 9 Theta-Axis Clockwise Positive Position Status**

Reports when the current joystick position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64805

Operational Range: same as data range

**SPN 4709      Joystick 9 Theta-Axis Position**

The position of the joystick in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

Data Length:	10 bits	
Resolution:	0.1 %/bit, 0 offset	
Data Range:	0 to 102 %	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64805	

**SPN 4710      Joystick 9 Theta-Axis Detent Position Status**

Reports when the current joystick position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64805	

**SPN 4711      Joystick 9 Grip Y-Axis Detent Position Status**

Reports when the current joystick grip position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64805	



**SPN 4712      Joystick 9 Grip X-Axis Detent Position Status**

Reports when the current joystick grip position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64805

Operational Range: same as data range

**SPN 4713      Joystick 10 X-Axis Neutral Position Status**

Reports when the current joystick position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64804

Operational Range: same as data range

**SPN 4714      Joystick 10 X-Axis Lever Left Negative Position Status**

Reports when the current joystick position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64804

Operational Range: same as data range

**SPN 4715      Joystick 10 X-Axis Lever Right Positive Position Status**

Reports when the current joystick position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64804

Operational Range: same as data range

**SPN 4716      Joystick 10 X-Axis Position**

The position of the joystick in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

Data Length: 10 bits  
Resolution: 0.1 %/bit, 0 offset  
Data Range: 0 to 102 %  
Type: Measured  
Supporting Information:  
PGN reference: 64804

Operational Range: same as data range

**SPN 4717      Joystick 10 Y-Axis Neutral Position Status**

Reports when the current joystick position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64804

Operational Range: same as data range

**SPN 4718      Joystick 10 Y-Axis Lever Back Negative Position Status**

Reports when the current joystick position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64804

Operational Range: same as data range

**SPN 4719      Joystick 10 Y-Axis Lever Forward Positive Position Status**

Reports when the current joystick position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64804

Operational Range: same as data range

**SPN 4720      Joystick 10 Y-Axis Position**

The position of the joystick in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

Data Length: 10 bits  
Resolution: 0.1 %/bit, 0 offset  
Data Range: 0 to 102 %  
Type: Measured  
Supporting Information:  
PGN reference: 64804

Operational Range: same as data range

**SPN 4721      Joystick 10 Y-Axis Detent Position Status**

Reports when the current joystick position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64804

Operational Range: same as data range

**SPN 4722      Joystick 10 X-Axis Detent Position Status**

Reports when the current joystick position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64804

Operational Range: same as data range

**SPN 4723      Joystick 10 Button 4 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64804

Operational Range: same as data range

**SPN 4724      Joystick 10 Button 3 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64804

Operational Range: same as data range

**SPN 4725      Joystick 10 Button 2 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64804

Operational Range: same as data range

**SPN 4726      Joystick 10 Button 1 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64804

Operational Range: same as data range

**SPN 4727      Joystick 10 Button 8 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64804

Operational Range: same as data range

**SPN 4728      Joystick 10 Button 7 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64804

Operational Range: same as data range

**SPN 4729      Joystick 10 Button 6 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64804

Operational Range: same as data range

**SPN 4730      Joystick 10 Button 5 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64804

Operational Range: same as data range

**SPN 4731      Joystick 10 Button 12 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64804

Operational Range: same as data range

**SPN 4732      Joystick 10 Button 11 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64804

Operational Range: same as data range

**SPN 4733      Joystick 10 Button 10 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64804

Operational Range: same as data range

**SPN 4734      Joystick 10 Button 9 Pressed Status**

Reports when the joystick button has been pressed.

00 Button not pressed  
01 Button pressed  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64804

Operational Range: same as data range

**SPN 4735      Joystick 10 Grip X-Axis Neutral Position Status**

Reports when the current joystick grip position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64803

Operational Range: same as data range



**SPN 4736      Joystick 10 Grip X-Axis Lever Left Negative Position Status**

Reports when the current joystick grip position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64803

Operational Range: same as data range

**SPN 4737      Joystick 10 Grip X-Axis Lever Right Positive Position Status**

Reports when the current joystick grip position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference: 64803

Operational Range: same as data range

**SPN 4738      Joystick 10 Grip X-Axis Position**

The position of the joystick grip in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

Data Length: 10 bits  
Resolution: 0.1 %/bit, 0 offset  
Data Range: 0 to 102 %  
Type: Measured  
Supporting Information:  
PGN reference: 64803

Operational Range: same as data range

**SPN 4739      Joystick 10 Grip Y-Axis Neutral Position Status**

Reports when the current joystick grip position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64803	

**SPN 4740      Joystick 10 Grip Y-Axis Lever Back Negative Position Status**

Reports when the current joystick grip position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64803	

**SPN 4741      Joystick 10 Grip Y-Axis Lever Forward Positive Position Status**

Reports when the current joystick grip position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64803	

**SPN 4742      Joystick 10 Grip Y-Axis Position**

The position of the joystick grip in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

Data Length:	10 bits	
Resolution:	0.1 %/bit, 0 offset	
Data Range:	0 to 102 %	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64803	

**SPN 4743      Joystick 10 Theta-Axis Neutral Position Status**

Reports when the current joystick position is in the neutral position for that axis of travel. The neutral position measurement must be determined from some mechanism other than the axis position measurement device.

00 Not in Neutral Position  
01 In Neutral Position  
10 Error Indicator  
11 Not Available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64803	

**SPN 4744      Joystick 10 Theta-Axis Counter Clockwise Negative Position Status**

Reports when the current joystick position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for that axis of travel.

00 Not on negative side of Neutral  
01 On negative side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64803	

**SPN 4745      Joystick 10 Theta-Axis Clockwise Positive Position Status**

Reports when the current joystick position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for that axis of travel.

00 Not on Positive side of Neutral  
01 On positive side of Neutral  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64803

Operational Range: same as data range

**SPN 4746      Joystick 10 Theta-Axis Position**

The position of the joystick in the relative motion of travel from the neutral position. Position value of 0 is Neutral and position value 1000 (100%) is the end of linear zone. Value of 1022 indicates an error has occurred.

Data Length:            10 bits  
Resolution:            0.1 %/bit, 0 offset  
Data Range:            0 to 102 %  
Type:                    Measured  
Supporting Information:  
PGN reference:        64803

Operational Range: same as data range

**SPN 4747      Joystick 10 Theta-Axis Detent Position Status**

Reports when the current joystick position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64803

Operational Range: same as data range

**SPN 4748      Joystick 10 Grip Y-Axis Detent Position Status**

Reports when the current joystick grip position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64803	

**SPN 4749      Joystick 10 Grip X-Axis Detent Position Status**

Reports when the current joystick grip position is in the detent position for that axis of travel.

00 Not in the Detent Position  
01 In the Detent Position  
10 Error Indicator  
11 Not Available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64803	

**(R) SPN 4750      Engine Exhaust Gas Recirculation 1 (EGR1) Cooler Intake Temperature**

Exhaust Gas Recirculation (EGR) Temperature measured at the EGR cooler intake. See SPN 412 for Engine EGR temperature which is typically measured at the EGR cooler outlet.

Data Length:	2 bytes	
Resolution:	0.03125 deg C/bit, -273 deg C offset	
Data Range:	-273 to 1734.96875 deg C	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64879	

**(R) SPN 4751      Engine Exhaust Gas Recirculation 1 (EGR1) Cooler Intake Gas Absolute Pressure**

Exhaust Gas Recirculation gas absolute pressure is measured at the EGR cooler intake. See SPN 3358 for EGR pressure measured at the EGR cooler outlet before the valve.

Data Length:	2 bytes	
Resolution:	0.5 kPa/bit, 0 offset	
Data Range:	0 to 32,127.5 kPa	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64879	

**(R) SPN 4752      Engine Exhaust Gas Recirculation 1 (EGR1) Cooler Efficiency**

Exhaust Gas Recirculation cooler efficiency is an indication of the cooler's ability to reduce the temperature of the exhaust gas that is being recirculated back to the intake. 0% = no reduction in temperature, 100% = maximum cooling. The EGR cooler efficiency is calculated as (EGR cooler intake temperature minus EGR gas temperature) divided by (EGR cooler intake temperature minus engine coolant temperature).

Data Length:	1 byte	
Resolution:	0.4 %/bit, 0 offset	
Data Range:	0 to 100 %	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64879	

**SPN 4753      Aftertreatment 1 Gas Oxidation Catalyst Intake Gas Temperature**

Temperature of engine combustion byproducts entering the gas oxidation catalyst in exhaust bank 1. This gas parameter should be used with engines fueled by gaseous fuel like natural gas or propane. A separate parameter has been defined for diesel fueled engines.

Data Length:	2 bytes	
Resolution:	0.03125 deg C/bit, -273 deg C offset	
Data Range:	-273 to 1734.96875 deg C	Operational Range: same as data range
Type:	Measured	
Supporting Information:	See Appendix D - PGN 64948	
PGN reference:	64802	

**SPN 4754      Aftertreatment 1 Gas Oxidation Catalyst Outlet Gas Temperature**

Temperature of engine combustion byproducts leaving the gas oxidation catalyst in exhaust bank 1. This gas parameter should be used with engines fueled by gaseous fuel like natural gas or propane. A separate parameter has been defined for diesel fueled engines

Data Length:	2 bytes	
Resolution:	0.03125 deg C/bit, -273 deg C offset	
Data Range:	-273 to 1734.96875 deg C	Operational Range: same as data range
Type:	Measured	
Supporting Information:	See Appendix D - PGN 64948	
PGN reference:	64802	

**SPN 4755      *Aftertreatment 1 Gas Oxidation Catalyst Differential Pressure***

Exhaust differential pressure measured between the intake and exhaust of the gas oxidation catalyst in exhaust bank 1. This gas parameter should be used with engines fueled by gaseous fuel like natural gas or propane. A separate parameter has been defined for diesel fueled engines.

Data Length:	2 bytes	
Resolution:	0.1 kPa/bit, 0 offset	
Data Range:	0 to 6,425.5 kPa	Operational Range: same as data range
Type:	Measured	
Supporting Information:	See Appendix D - PGN 64948	
PGN reference:	64802	

**SPN 4756      *Aftertreatment 1 Gas Oxidation Catalyst Intake Gas Temperature Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the gas oxidation catalyst intake gas temperature sensor by the manufacturer's sensor control software in exhaust bank 1. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated. This gas parameter should be used with engines fueled by gaseous fuel like natural gas or propane. A separate parameter has been defined for diesel fueled engines.

Data Length:	5 bits	
Resolution:	Binary, 0 offset	
Data Range:	0 to 31	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64802	

**SPN 4757      *Aftertreatment 1 Gas Oxidation Catalyst Outlet Gas Temperature Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the gas oxidation catalyst outlet gas temperature sensor by the manufacturer's sensor control software in exhaust bank 1. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated. This gas parameter should be used with engines fueled by gaseous fuel like natural gas or propane. A separate parameter has been defined for diesel fueled engines.

Data Length:	5 bits	
Resolution:	Binary, 0 offset	
Data Range:	0 to 31	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64802	

**SPN 4758      *Aftertreatment 1 Gas Oxidation Catalyst Differential Pressure Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the gas oxidation catalyst differential pressure sensor by the manufacturer's sensor control software in exhaust bank 1. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated. This gas parameter should be used with engines fueled by gaseous fuel like natural gas or propane. A separate parameter has been defined for diesel fueled engines.

Data Length:	5 bits	
Resolution:	Binary, 0 offset	
Data Range:	0 to 31	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64802	

**SPN 4759      *Aftertreatment 2 Gas Oxidation Catalyst Intake Gas Temperature***

Temperature of engine combustion byproducts entering the gas oxidation catalyst in exhaust bank 2. This gas parameter should be used with engines fueled by gaseous fuel like natural gas or propane. A separate parameter has been defined for diesel fueled engines.

Data Length:	2 bytes	
Resolution:	0.03125 deg C/bit, -273 deg C offset	
Data Range:	-273 to 1734.96875 deg C	Operational Range: same as data range
Type:	Measured	
Supporting Information:	See Appendix D - PGN 64948	
PGN reference:	64801	

**SPN 4760      *Aftertreatment 2 Gas Oxidation Catalyst Outlet Gas Temperature***

Temperature of engine combustion byproducts leaving the gas oxidation catalyst in exhaust bank 2. This gas parameter should be used with engines fueled by gaseous fuel like natural gas or propane. A separate parameter has been defined for diesel fueled engines.

Data Length:	2 bytes	
Resolution:	0.03125 deg C/bit, -273 deg C offset	
Data Range:	-273 to 1734.96875 deg C	Operational Range: same as data range
Type:	Measured	
Supporting Information:	See Appendix D - PGN 64948	
PGN reference:	64801	

**SPN 4761      *Aftertreatment 2 Gas Oxidation Catalyst Differential Pressure***

Exhaust differential pressure measured between the intake and exhaust of the gas oxidation catalyst in exhaust bank 2. This gas parameter should be used with engines fueled by gaseous fuel like natural gas or propane. A separate parameter has been defined for diesel fueled engines.

Data Length:	2 bytes	
Resolution:	0.1 kPa/bit, 0 offset	
Data Range:	0 to 6,425.5 kPa	Operational Range: same as data range
Type:	Measured	
Supporting Information:	See Appendix D - PGN 64948	
PGN reference:	64801	



**SPN 4762      *Aftertreatment 2 Gas Oxidation Catalyst Intake Gas Temperature Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the gas oxidation catalyst intake gas temperature sensor by the manufacturer's sensor control software in exhaust bank 2. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated. This gas parameter should be used with engines fueled by gaseous fuel like natural gas or propane. A separate parameter has been defined for diesel fueled engines.

Data Length:	5 bits	
Resolution:	Binary, 0 offset	
Data Range:	0 to 31	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64801	

**SPN 4763      *Aftertreatment 2 Gas Oxidation Catalyst Outlet Gas Temperature Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the gas oxidation catalyst outlet gas temperature sensor by the manufacturer's sensor control software in exhaust bank 2. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated. This gas parameter should be used with engines fueled by gaseous fuel like natural gas or propane. A separate parameter has been defined for diesel fueled engines.

Data Length:	5 bits	
Resolution:	Binary, 0 offset	
Data Range:	0 to 31	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64801	

**SPN 4764      *Aftertreatment 2 Gas Oxidation Catalyst Differential Pressure Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the gas oxidation catalyst differential pressure sensor by the manufacturer's sensor control software in exhaust bank 2. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated. This gas parameter should be used with engines fueled by gaseous fuel like natural gas or propane. A separate parameter has been defined for diesel fueled engines.

Data Length:	5 bits	
Resolution:	Binary, 0 offset	
Data Range:	0 to 31	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64801	

**SPN 4765      *Aftertreatment 1 Diesel Oxidation Catalyst Intake Gas Temperature***

Temperature of engine combustion byproducts entering the diesel oxidation catalyst in exhaust bank 1. This diesel parameter should be used with engines fueled by diesel fuel (not gaseous fuel like natural gas or propane). A separate parameter has been defined for gas fueled engines.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 64800

**SPN 4766      *Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature***

Temperature of engine combustion byproducts leaving the diesel oxidation catalyst exhaust in exhaust bank 1. This diesel parameter should be used with engines fueled by diesel fuel (not gaseous fuel like natural gas or propane). A separate parameter has been defined for gas fueled engines.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 64800

**SPN 4767      *Aftertreatment 1 Diesel Oxidation Catalyst Differential Pressure***

Exhaust differential pressure measured between the intake and exhaust of a diesel oxidation catalyst in exhaust bank 1. This diesel parameter should be used with engines fueled by diesel fuel (not gaseous fuel like natural gas or propane). A separate parameter has been defined for gas fueled engines.

Data Length: 2 bytes  
Resolution: 0.1 kPa/bit, 0 offset  
Data Range: 0 to 6,425.5 kPa      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 64800

**SPN 4768      *Aftertreatment 1 Diesel Oxidation Catalyst Intake Gas Temperature Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the diesel oxidation catalyst intake gas temperature sensor by the manufacturer's sensor control software in exhaust bank 1. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated. This diesel parameter should be used with engines fueled by diesel fuel (not gaseous fuel like natural gas or propane). A separate parameter has been defined for gas fueled engines.

Data Length: 5 bits  
Resolution: Binary, 0 offset  
Data Range: 0 to 31      Operational Range: same as data range  
Type: Status  
Supporting Information:  
PGN reference: 64800

**SPN 4769      *Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the diesel oxidation catalyst outlet gas temperature sensor by the manufacturer's sensor control software in exhaust bank 1. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated. This gas parameter should be used with engines fueled by gaseous fuel like natural gas or propane. A separate parameter has been defined for diesel fueled engines.

Data Length:	5 bits	
Resolution:	Binary, 0 offset	
Data Range:	0 to 31	Operational Range: same as data range
Type:	Status	
Supporting Information:	See Appendix D - PGN 64948	
PGN reference:	64800	

**SPN 4770      *Aftertreatment 1 Diesel Oxidation Catalyst Differential Pressure Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the diesel oxidation catalyst differential pressure sensor by the manufacturer's sensor control software in exhaust bank 1. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated. This diesel parameter should be used with engines fueled by diesel fuel (not gaseous fuel like natural gas or propane). A separate parameter has been defined for gas fueled engines.

Data Length:	5 bits	
Resolution:	Binary, 0 offset	
Data Range:	0 to 31	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64800	

**SPN 4771      *Aftertreatment 2 Diesel Oxidation Catalyst Intake Gas Temperature***

Temperature of engine combustion byproducts entering the diesel oxidation catalyst in exhaust bank 2. This diesel parameter should be used with engines fueled by diesel fuel (not gaseous fuel like natural gas or propane). A separate parameter has been defined for gas fueled engines.

Data Length:	2 bytes	
Resolution:	0.03125 deg C/bit, -273 deg C offset	
Data Range:	-273 to 1734.96875 deg C	Operational Range: same as data range
Type:	Measured	
Supporting Information:	See Appendix D - PGN 64948	
PGN reference:	64799	

**SPN 4772      *Aftertreatment 2 Diesel Oxidation Catalyst Outlet Gas Temperature***

Temperature of engine combustion byproducts leaving the diesel oxidation catalyst exhaust in exhaust bank 2. This diesel parameter should be used with engines fueled by diesel fuel (not gaseous fuel like natural gas or propane). A separate parameter has been defined for gas fueled engines.

Data Length:	2 bytes	
Resolution:	0.03125 deg C/bit, -273 deg C offset	
Data Range:	-273 to 1734.96875 deg C	Operational Range: same as data range
Type:	Measured	
Supporting Information:	See Appendix D - PGN 64948	
PGN reference:	64799	

**SPN 4773      *Aftertreatment 2 Diesel Oxidation Catalyst Differential Pressure***

Exhaust differential pressure measured between the intake and exhaust of a diesel oxidation catalyst in exhaust bank 2. This diesel parameter should be used with engines fueled by diesel fuel (not gaseous fuel like natural gas or propane). A separate parameter has been defined for gas fueled engines.

Data Length:	2 bytes	
Resolution:	0.5 kPa/bit, 0 offset	
Data Range:	0 to 32,127.5 kPa	Operational Range: same as data range
Type:	Measured	
Supporting Information:	See Appendix D - PGN 64948	
PGN reference:	64799	

**SPN 4774      *Aftertreatment 2 Diesel Oxidation Catalyst Intake Gas Temperature Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the diesel oxidation catalyst intake gas temperature sensor by the manufacturer's sensor control software in exhaust bank 2. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated. This diesel parameter should be used with engines fueled by diesel fuel (not gaseous fuel like natural gas or propane). A separate parameter has been defined for gas fueled engines.

Data Length:	5 bits	
Resolution:	Binary, 0 offset	
Data Range:	0 to 31	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64799	

**SPN 4775      *Aftertreatment 2 Diesel Oxidation Catalyst Outlet Gas Temperature Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the diesel oxidation catalyst outlet gas temperature sensor by the manufacturer's sensor control software in exhaust bank 2. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated. This gas parameter should be used with engines fueled by gaseous fuel like natural gas or propane. A separate parameter has been defined for diesel fueled engines.

Data Length:	5 bits	
Resolution:	Binary, 0 offset	
Data Range:	0 to 31	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64799	

**SPN 4776      *Aftertreatment 2 Diesel Oxidation Catalyst Differential Pressure Preliminary FMI***

Used to identify the applicable J1939-73 FMI detected in the diesel oxidation catalyst differential pressure sensor by the manufacturer's sensor control software in exhaust bank 2. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated. This diesel parameter should be used with engines fueled by diesel fuel (not gaseous fuel like natural gas or propane). A separate parameter has been defined for gas fueled engines.

Data Length:	5 bits	
Resolution:	Binary, 0 offset	
Data Range:	0 to 31	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64799	

**SPN 4777      *Aftertreatment 1 Gas Oxidation Catalyst Differential Gas Temperature***

The differential engine combustion byproducts gas temperature measured between the intake and outlet of the gas oxidation catalyst for exhaust bank 1. This gas parameter should be used with engine fueled by gaseous fuel like natural gas or propane. Diesel engines should not use this parameter.

Data Length:	2 bytes	
Resolution:	0.03125 deg C/bit, -273 deg C offset	
Data Range:	-273 to 1734.96875 deg C	Operational Range: same as data range
Type:	Measured	
Supporting Information:	See Appendix D - PGN 64948	
PGN reference:	64798	

**SPN 4778      *Aftertreatment 2 Gas Oxidation Catalyst Differential Gas Temperature***

The differential engine combustion byproducts gas temperature measured between the intake and outlet of the gas oxidation catalyst for exhaust bank 2. This gas parameter should be used with engine fueled by gaseous fuel like natural gas or propane. Diesel engines should not use this parameter.

Data Length:	2 bytes	
Resolution:	0.03125 deg C/bit, -273 deg C offset	
Data Range:	-273 to 1734.96875 deg C	Operational Range: same as data range
Type:	Measured	
Supporting Information:	See Appendix D - PGN 64948	
PGN reference:	64798	

**SPN 4779      *Aftertreatment 1 Three Way Catalyst Differential Gas Temperature***

The differential engine combustion byproducts gas temperature measured between the intake and outlet of the three way catalyst for exhaust bank 1.

Data Length:	2 bytes	
Resolution:	0.03125 deg C/bit, -273 deg C offset	
Data Range:	-273 to 1734.96875 deg C	Operational Range: same as data range
Type:	Measured	
Supporting Information:	See Appendix D - PGN 64948	
PGN reference:	64797	

**SPN 4780      *Aftertreatment 2 Three Way Catalyst Differential Gas Temperature***

The differential engine combustion byproducts gas temperature measured between the intake and outlet of the three way catalyst for exhaust bank 2.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information: See Appendix D - PGN 64948  
PGN reference: 64797

**SPN 4781      *Diesel Particulate Filter 1 Soot Mass***

Soot mass in diesel particulate filter 1.

Data Length: 1 byte  
Resolution: 4 g/bit, 0 offset  
Data Range: 0 to 1000 g      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 64796

**SPN 4782      *Diesel Particulate Filter 1 Soot Density***

Soot density in diesel particulate filter 1.

Data Length: 1 byte  
Resolution: 0.08 g/L per bit, 0 offset  
Data Range: 0 to 20.0 g/L      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 64796

**SPN 4783      *Diesel Particulate Filter 1 Mean Soot Signal***

Mean output signal level from diesel particulate filter 1 soot sensor.

Data Length: 2 bytes  
Resolution: 0.0025 %/bit, 0 offset  
Data Range: 0 to 160.6375 %      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 64796

**SPN 4784 Diesel Particulate Filter 1 Median Soot Signal**

Median output signal level from diesel particulate filter 1 soot sensor.

Data Length:	2 bytes	
Resolution:	0.0025 %/bit, 0 offset	
Data Range:	0 to 160.6375 %	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64796	

**SPN 4785 Diesel Particulate Filter 1 Soot Sensor Preliminary FMI**

Used to identify the applicable J1939-73 FMI detected in the soot sensor signal by the manufacturer's sensor control software in diesel particulate filter 1. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

Data Length:	5 bits	
Resolution:	Binary, 0 offset	
Data Range:	0 to 31	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64796	

**SPN 4786 Diesel Particulate Filter 2 Soot Mass**

Soot mass in diesel particulate filter 2.

Data Length:	1 byte	
Resolution:	4 g/bit, 0 offset	
Data Range:	0 to 1000 g	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64795	

**SPN 4787 Diesel Particulate Filter 2 Soot Density**

Soot density in diesel particulate filter 2.

Data Length:	1 byte	
Resolution:	0.08 g/L per bit, 0 offset	
Data Range:	0 to 20.0 g/L	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64795	

**SPN 4788 Diesel Particulate Filter 2 Mean Soot Signal**

Mean output signal level from diesel particulate filter 2 soot sensor.

Data Length:	2 bytes	
Resolution:	0.0025 %/bit, 0 offset	
Data Range:	0 to 160.6375 %	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64795	

**SPN 4789 Diesel Particulate Filter 2 Median Soot Signal**

Median output signal level from diesel particulate filter 2 soot sensor.

Data Length:	2 bytes	
Resolution:	0.0025 %/bit, 0 offset	
Data Range:	0 to 160.6375 %	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64795	

**SPN 4790 Diesel Particulate Filter 2 Soot Sensor Preliminary FMI**

Used to identify the applicable J1939-73 FMI detected in the soot sensor signal by the manufacturer's sensor control software in diesel particulate filter 2. When there is no failure FMI 31 is sent. In the case of multiple failures the most severe is communicated.

Data Length:	5 bits	
Resolution:	Binary, 0 offset	
Data Range:	0 to 31	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64795	

**(R) SPN 4809 Aftertreatment 1 Warm Up Diesel Oxidation Catalyst Intake Temperature**

This is the temperature measured at the intake of the warm up oxidation catalytic converter in exhaust bank 1.

Data Length:	2 bytes	
Resolution:	0.03125 deg C/bit, -273 deg C offset	
Data Range:	-273 to 1734.96875 deg C	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64794	



**SPN 4810      *Aftertreatment 1 Warm Up Diesel Oxidation Catalyst Outlet Temperature***

This is the temperature measured at the outlet of the warm up oxidation catalytic converter in exhaust bank 1.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 64794

**SPN 4811      *Engine Oil Pressure in Piston Cooling Gallery***

Pressure of the engine lubricating oil in the gallery that feeds the piston cooling spray nozzles. The pressure in this gallery varies from the main engine oil fed to the bearings, and is usually lower.

Data Length: 1 byte  
Resolution: 4 kPa/bit, 0 offset  
Data Range: 0 to 1000 kPa      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference:

**SPN 4812      *Engine Piston Cooling Oil Supply Valve Opening***

Command for the Piston Cooling Valve opening; zero is closed (no oil to cool the pistons) and 100% is open (all possible oil flowing to cool the pistons.)

Data Length: 1 byte  
Resolution: 0.4 %/bit, 0 offset  
Data Range: 0 to 100 %      Operational Range: same as data range  
Type: Status  
Supporting Information:  
PGN reference:

**SPN 4813      *Engine Oil Thermostat Bypass Valve Opening***

Command to the valve that directs engine oil around the oil thermostat. Zero means closed (all oil flows through the thermostat passage) and 100% means open (all possible oil bypasses the thermostat.)

Data Length: 1 byte  
Resolution: 0.4 %/bit, 0 offset  
Data Range: 0 to 100 %      Operational Range: same as data range  
Type: Status  
Supporting Information:  
PGN reference:

**SPN 4814      Engine Coolant Pump command**

Command for a coolant pump that can be driven at varying output level. A command of zero is pump OFF, 100% results in maximum coolant flow. The pump may allow adjustment of coolant flow by varying the pump speed. The ECU commands a percentage of maximum pump output.

Data Length:	1 byte	
Resolution:	0.4 %/bit, 0 offset	
Data Range:	0 to 100 %	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:		

**SPN 4815      Engine Cooling Fan Thermal Switch Position**

This is a feedback measurement of the position of a thermal switch that turns on an engine cooling fan.

0 = OFF (cooling flow not needed)  
1 = ON (cooling flow demanded)  
2 = ERROR  
3 = Not Available

Note that this is not a command to turn the fan on, nor a direct measurement of fan speed to assure that the fan is working. It is a measurement of the position of a switch that is activated by temperature, and provides feedback to the ECU of the state of that thermal switch.

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:		

**SPN 4816      Transmission Torque Converter Lockup Transition in Process**

State signal indicating whether or not the transmission torque converter lock up clutch is transitioning between being applied and being released. The broadcast value should be set to 01 as soon as an apply or release of the lockup clutch is initiated, and then set to 00 once the given transition is complete. This parameter is a companion to SPN 573 Transmission Torque Converter Lockup Engaged.

00 - Transition is not in process  
01 - Transition is in process  
10 - Error  
11 - Not available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	61442	

**SPN 4817      Engine Intake Manifold #1 Absolute Pressure (High Resolution)**

The absolute pressure measurement of the air intake manifold. If there are multiple air pressure sensors in the intake stream, this is the last one in flow direction before entering the combustion chamber. This SPN is a high resolution measurement. See SPN 3563 if high resolution is not needed.

Data Length:	2 bytes	
Resolution:	0.1 kPa/bit, 0 offset	
Data Range:	0 to 6,425.5 kPa	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64976	

**SPN 4818      Driver Airbag Ignitor Loop 1st Stage - Resistance**

Resistance of Driver Airbag Ignitor Loop 1st Stage.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4819      Passenger Airbag Ignitor Loop 1st Stage - Resistance**

Resistance of Passenger Airbag Ignitor Loop 1st Stage.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4820      Driver Airbag Ignitor Loop 2nd Stage - Resistance**

Resistance of Driver Airbag Ignitor Loop 2nd Stage.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4821      Passenger Airbag Ignitor Loop 2nd Stage - Resistance**

Resistance of Passenger Airbag Ignitor Loop 2nd Stage.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4822      Driver Belt Tensioner Ignitor Loop - Resistance**

Resistance of Driver Belt Tensioner Ignitor Loop 1st Stage.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4823      Passenger Belt Tensioner Ignitor Loop - Resistance**

Resistance of Passenger Belt Tensioner Ignitor Loop 1st Stage.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4824      Side Bag Ignitor Loop 1 - Left - Resistance**

Resistance of Side Bag Ignitor Loop 1 - Left.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4825      Side Bag Ignitor Loop 2 - Left - Resistance**

Resistance of Side Bag Ignitor Loop 2 - Left.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4826      Side Bag Ignitor Loop 1 - Right - Resistance**

Resistance of Side Bag Ignitor Loop 1 - Right.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4827      Side Bag Ignitor Loop 2 - Right - Resistance**

Resistance of Side Bag Ignitor Loop 2 - Right.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4828      Special Ignitor Loop 1 - Resistance**

Resistance of Special Ignitor Loop 1. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4829      *Special Ignitor Loop 2 - Resistance***

Resistance of Special Ignitor Loop 2. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4830      *Special Ignitor Loop 3 - Resistance***

Resistance of Special Ignitor Loop 3. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4831      *Special Ignitor Loop 4 - Resistance***

Resistance of Special Ignitor Loop 4. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4832      *Special Ignitor Loop 5 - Resistance***

Resistance of Special Ignitor Loop 5. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4833      Special Ignitor Loop 6 - Resistance**

Resistance of Special Ignitor Loop 6. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4834      Special Ignitor Loop 7 - Resistance**

Resistance of Special Ignitor Loop 7. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4835      Special Ignitor Loop 8 - Resistance**

Resistance of Special Ignitor Loop 8. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4836      Special Ignitor Loop 9 - Resistance**

Resistance of Special Ignitor Loop 9. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4837      *Special Ignitor Loop 10 - Resistance***

Resistance of Special Ignitor Loop 10. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4838      *Special Ignitor Loop 11 - Resistance***

Resistance of Special Ignitor Loop 11. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4839      *Special Ignitor Loop 12 - Resistance***

Resistance of Special Ignitor Loop 12. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4840      *Special Ignitor Loop 13 - Resistance***

Resistance of Special Ignitor Loop 13. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	



**SPN 4841      *Special Ignitor Loop 14 - Resistance***

Resistance of Special Ignitor Loop 14. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4842      *Special Ignitor Loop 15 - Resistance***

Resistance of Special Ignitor Loop 15. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4843      *Special Ignitor Loop 16 - Resistance***

Resistance of Special Ignitor Loop 16. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4844      *Special Ignitor Loop 17 - Resistance***

Resistance of Special Ignitor Loop 17. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4845      *Special Ignitor Loop 18 - Resistance***

Resistance of Special Ignitor Loop 18. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4846      *Special Ignitor Loop 19 - Resistance***

Resistance of Special Ignitor Loop 19. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4847      *Special Ignitor Loop 20 - Resistance***

Resistance of Special Ignitor Loop 20. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4848      *Special Ignitor Loop 21 - Resistance***

Resistance of Special Ignitor Loop 21. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4849      Special Ignitor Loop 22 - Resistance**

Resistance of Special Ignitor Loop 22. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4850      Special Ignitor Loop 23 - Resistance**

Resistance of Special Ignitor Loop 23. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4851      Special Ignitor Loop 24 - Resistance**

Resistance of Special Ignitor Loop 24. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4852      Special Ignitor Loop 25 - Resistance**

Resistance of Special Ignitor Loop 25. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4853      Special Ignitor Loop 26 - Resistance**

Resistance of Special Ignitor Loop 26. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4854      Special Ignitor Loop 27 - Resistance**

Resistance of Special Ignitor Loop 27. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4855      Special Ignitor Loop 28 - Resistance**

Resistance of Special Ignitor Loop 28. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4856      Special Ignitor Loop 29 - Resistance**

Resistance of Special Ignitor Loop 29. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4857      Special Ignitor Loop 30 - Resistance**

Resistance of Special Ignitor Loop 30. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4858      Special Ignitor Loop 31 - Resistance**

Resistance of Special Ignitor Loop 31. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4859      Special Ignitor Loop 32 - Resistance**

Resistance of Special Ignitor Loop 32. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4860      Special Ignitor Loop 33 - Resistance**

Resistance of Special Ignitor Loop 33. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4861      *Special Ignitor Loop 34 - Resistance***

Resistance of Special Ignitor Loop 34. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4862      *Special Ignitor Loop 35 - Resistance***

Resistance of Special Ignitor Loop 35. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4863      *Special Ignitor Loop 36 - Resistance***

Resistance of Special Ignitor Loop 36. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4864      *Special Ignitor Loop 37 - Resistance***

Resistance of Special Ignitor Loop 37. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4865      Special Ignitor Loop 38 - Resistance**

Resistance of Special Ignitor Loop 38. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4866      Special Ignitor Loop 39 - Resistance**

Resistance of Special Ignitor Loop 39. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4867      Special Ignitor Loop 40 - Resistance**

Resistance of Special Ignitor Loop 40. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4868      Special Ignitor Loop 41 - Resistance**

Resistance of Special Ignitor Loop 41. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4869      Special Ignitor Loop 42 - Resistance**

Resistance of Special Ignitor Loop 42. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4870      Special Ignitor Loop 43 - Resistance**

Resistance of Special Ignitor Loop 43. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4871      Special Ignitor Loop 44 - Resistance**

Resistance of Special Ignitor Loop 44. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4872      Special Ignitor Loop 45 - Resistance**

Resistance of Special Ignitor Loop 45. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	



**SPN 4873      Special Ignitor Loop 46 - Resistance**

Resistance of Special Ignitor Loop 46. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4874      Special Ignitor Loop 47 - Resistance**

Resistance of Special Ignitor Loop 47. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4875      Special Ignitor Loop 48 - Resistance**

Resistance of Special Ignitor Loop 48. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4876      Special Ignitor Loop 49 - Resistance**

Resistance of Special Ignitor Loop 49. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

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**SPN 4877      *Special Ignitor Loop 50 - Resistance***

Resistance of Special Ignitor Loop 50. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4878      *Special Ignitor Loop 51 - Resistance***

Resistance of Special Ignitor Loop 51. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4879      *Special Ignitor Loop 52 - Resistance***

Resistance of Special Ignitor Loop 52. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4880      *Special Ignitor Loop 53 - Resistance***

Resistance of Special Ignitor Loop 53. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4881      Special Ignitor Loop 54 - Resistance**

Resistance of Special Ignitor Loop 54. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4882      Special Ignitor Loop 55 - Resistance**

Resistance of Special Ignitor Loop 55. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4883      Special Ignitor Loop 56 - Resistance**

Resistance of Special Ignitor Loop 56. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4884      Special Ignitor Loop 57 - Resistance**

Resistance of Special Ignitor Loop 57. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4885      *Special Ignitor Loop 58 - Resistance***

Resistance of Special Ignitor Loop 58. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4886      *Special Ignitor Loop 59 - Resistance***

Resistance of Special Ignitor Loop 59. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4887      *Special Ignitor Loop 60 - Resistance***

Resistance of Special Ignitor Loop 60. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4888      *Special Ignitor Loop 61 - Resistance***

Resistance of Special Ignitor Loop 61. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4889      Special Ignitor Loop 62 - Resistance**

Resistance of Special Ignitor Loop 62. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:		

**SPN 4890      Special Ignitor Loop 63 - Resistance**

Resistance of Special Ignitor Loop 63. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4891      Special Ignitor Loop 64 - Resistance**

Resistance of Special Ignitor Loop 64. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4892      Special Ignitor Loop 65 - Resistance**

Resistance of Special Ignitor Loop 65. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4893      Special Ignitor Loop 66 - Resistance**

Resistance of Special Ignitor Loop 66. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4894      Special Ignitor Loop 67 - Resistance**

Resistance of Special Ignitor Loop 67. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4895      Special Ignitor Loop 68 - Resistance**

Resistance of Special Ignitor Loop 68. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4896      Special Ignitor Loop 69 - Resistance**

Resistance of Special Ignitor Loop 69. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4897      Special Ignitor Loop 70 - Resistance**

Resistance of Special Ignitor Loop 70. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4898      Special Ignitor Loop 71 - Resistance**

Resistance of Special Ignitor Loop 71. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4899      Special Ignitor Loop 72 - Resistance**

Resistance of Special Ignitor Loop 72. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4900      Special Ignitor Loop 73 - Resistance**

Resistance of Special Ignitor Loop 73. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4901      Special Ignitor Loop 74 - Resistance**

Resistance of Special Ignitor Loop 74. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4902      Special Ignitor Loop 75 - Resistance**

Resistance of Special Ignitor Loop 75. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4903      Special Ignitor Loop 76 - Resistance**

Resistance of Special Ignitor Loop 76. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4904      Special Ignitor Loop 77 - Resistance**

Resistance of Special Ignitor Loop 77. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	



**SPN 4905      *Special Ignitor Loop 78 - Resistance***

Resistance of Special Ignitor Loop 78. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4906      *Special Ignitor Loop 79 - Resistance***

Resistance of Special Ignitor Loop 79. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4907      *Special Ignitor Loop 80 - Resistance***

Resistance of Special Ignitor Loop 80. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4908      *Special Ignitor Loop 81 - Resistance***

Resistance of Special Ignitor Loop 81. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4909      Special Ignitor Loop 82 - Resistance**

Resistance of Special Ignitor Loop 82. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4910      Special Ignitor Loop 83 - Resistance**

Resistance of Special Ignitor Loop 83. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4911      Special Ignitor Loop 84 - Resistance**

Resistance of Special Ignitor Loop 84. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4912      Special Ignitor Loop 85 - Resistance**

Resistance of Special Ignitor Loop 85. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4913      *Special Ignitor Loop 86 - Resistance***

Resistance of Special Ignitor Loop 86. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4914      *Special Ignitor Loop 87 - Resistance***

Resistance of Special Ignitor Loop 87. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4915      *Special Ignitor Loop 88 - Resistance***

Resistance of Special Ignitor Loop 88. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4916      *Special Ignitor Loop 89 - Resistance***

Resistance of Special Ignitor Loop 89. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4917      *Special Ignitor Loop 90 - Resistance***

Resistance of Special Ignitor Loop 90. Since there are many different vehicle types (e.g. truck, bus, firetruck or ambulance), the ignitor loop configuration has a wide variation.

Data Length:	2 bytes	
Resolution:	0.1 ohm/bit, 0 offset	
Data Range:	0 to 6425.5 ohm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64793	

**SPN 4918      *Frontal Collision Sensor 1 - Type***

Type of Frontal Collision Sensor 1.

0000 = acceleration sensor  
0001 = pressure sensor  
0010 = rollrate sensor  
0011 = sonic sensor  
0100 = fiber-optic sensor  
0101 = radar sensor  
0110 = lidar sensor  
0111 = optical sensor  
1000-1101 = Reserved  
1110 = Error - Type of sensor cannot be determined (unknown sensor)  
1111 = not available

Data Length:	4 bits	
Resolution:	16 states/4 bit, 0 offset	
Data Range:	0 to 15	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64792	

**SPN 4919      Frontal Collision Sensor 2 - Type**

Type of Frontal Collision Sensor 2.

0000 = acceleration sensor  
0001 = pressure sensor  
0010 = rollrate sensor  
0011 = sonic sensor  
0100 = fiber-optic sensor  
0101 = radar sensor  
0110 = lidar sensor  
0111 = optical sensor  
1000-1101 = Reserved  
1110 = Error - Type of sensor cannot be determined (unknown sensor)  
1111 = not available

Data Length:	4 bits	
Resolution:	16 states/4 bit, 0 offset	
Data Range:	0 to 15	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64792	

**SPN 4920      Frontal Collision Sensor 3 - Type**

Type of Frontal Collision Sensor 3.

0000 = acceleration sensor  
0001 = pressure sensor  
0010 = rollrate sensor  
0011 = sonic sensor  
0100 = fiber-optic sensor  
0101 = radar sensor  
0110 = lidar sensor  
0111 = optical sensor  
1000-1101 = Reserved  
1110 = Error - Type of sensor cannot be determined (unknown sensor)  
1111 = not available

Data Length:	4 bits	
Resolution:	16 states/4 bit, 0 offset	
Data Range:	0 to 15	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64792	

**SPN 4921      Frontal Collision Sensor 4 - Type**

Type of Frontal Collision Sensor 4.

0000 = acceleration sensor  
0001 = pressure sensor  
0010 = rollrate sensor  
0011 = sonic sensor  
0100 = fiber-optic sensor  
0101 = radar sensor  
0110 = lidar sensor  
0111 = optical sensor  
1000-1101 = Reserved  
1110 = Error - Type of sensor cannot be determined (unknown sensor)  
1111 = not available

Data Length:	4 bits	
Resolution:	16 states/4 bit, 0 offset	
Data Range:	0 to 15	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64792	

**SPN 4922      Side Collision Sensor Front Left - Type**

Type of Side Collision Sensor Front - Left.

0000 = acceleration sensor  
0001 = pressure sensor  
0010 = rollrate sensor  
0011 = sonic sensor  
0100 = fiber-optic sensor  
0101 = radar sensor  
0110 = lidar sensor  
0111 = optical sensor  
1000-1101 = Reserved  
1110 = Error - Type of sensor cannot be determined (unknown sensor)  
1111 = not available

Data Length:	4 bits	
Resolution:	16 states/4 bit, 0 offset	
Data Range:	0 to 15	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64792	

**SPN 4923      Side Collision Sensor Mid Front Left - Type**

Type of Side Collision Sensor Mid Front - Left.

0000 = acceleration sensor  
0001 = pressure sensor  
0010 = rollrate sensor  
0011 = sonic sensor  
0100 = fiber-optic sensor  
0101 = radar sensor  
0110 = lidar sensor  
0111 = optical sensor  
1000-1101 = Reserved  
1110 = Error - Type of sensor cannot be determined (unknown sensor)  
1111 = not available

Data Length:	4 bits	
Resolution:	16 states/4 bit, 0 offset	
Data Range:	0 to 15	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64792	

**SPN 4924      Side Collision Sensor Mid Rear Left - Type**

Type of Side Collision Sensor Mid Rear - Left.

0000 = acceleration sensor  
0001 = pressure sensor  
0010 = rollrate sensor  
0011 = sonic sensor  
0100 = fiber-optic sensor  
0101 = radar sensor  
0110 = lidar sensor  
0111 = optical sensor  
1000-1101 = Reserved  
1110 = Error - Type of sensor cannot be determined (unknown sensor)  
1111 = not available

Data Length:	4 bits	
Resolution:	16 states/4 bit, 0 offset	
Data Range:	0 to 15	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64792	

**SPN 4925      Side Collision Sensor Rear Left - Type**

Type of Side Collision Sensor Rear - Left.

0000 = acceleration sensor  
0001 = pressure sensor  
0010 = rollrate sensor  
0011 = sonic sensor  
0100 = fiber-optic sensor  
0101 = radar sensor  
0110 = lidar sensor  
0111 = optical sensor  
1000-1101 = Reserved  
1110 = Error - Type of sensor cannot be determined (unknown sensor)  
1111 = not available

Data Length:	4 bits	
Resolution:	16 states/4 bit, 0 offset	
Data Range:	0 to 15	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64792	

**SPN 4926      Side Collision Sensor Front Right - Type**

Type of Side Collision Sensor Front - Right.

0000 = acceleration sensor  
0001 = pressure sensor  
0010 = rollrate sensor  
0011 = sonic sensor  
0100 = fiber-optic sensor  
0101 = radar sensor  
0110 = lidar sensor  
0111 = optical sensor  
1000-1101 = Reserved  
1110 = Error - Type of sensor cannot be determined (unknown sensor)  
1111 = not available

Data Length:	4 bits	
Resolution:	16 states/4 bit, 0 offset	
Data Range:	0 to 15	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64792	



**SPN 4927      Side Collision Sensor Mid Front Right - Type**

Type of Side Collision Sensor Mid Front - Right.

0000 = acceleration sensor  
0001 = pressure sensor  
0010 = rollrate sensor  
0011 = sonic sensor  
0100 = fiber-optic sensor  
0101 = radar sensor  
0110 = lidar sensor  
0111 = optical sensor  
1000-1101 = Reserved  
1110 = Error - Type of sensor cannot be determined (unknown sensor)  
1111 = not available

Data Length:	4 bits	
Resolution:	16 states/4 bit, 0 offset	
Data Range:	0 to 15	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64792	

**SPN 4928      Side Collision Sensor Mid Rear Right - Type**

Type of Side Collision Sensor Mid Rear - Right.

0000 = acceleration sensor  
0001 = pressure sensor  
0010 = rollrate sensor  
0011 = sonic sensor  
0100 = fiber-optic sensor  
0101 = radar sensor  
0110 = lidar sensor  
0111 = optical sensor  
1000-1101 = Reserved  
1110 = Error - Type of sensor cannot be determined (unknown sensor)  
1111 = not available

Data Length:	4 bits	
Resolution:	16 states/4 bit, 0 offset	
Data Range:	0 to 15	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64792	

**SPN 4929      Side Collision Sensor Rear Right - Type**

Type of Side Collision Sensor Rear - Right.

0000 = acceleration sensor  
0001 = pressure sensor  
0010 = rollrate sensor  
0011 = sonic sensor  
0100 = fiber-optic sensor  
0101 = radar sensor  
0110 = lidar sensor  
0111 = optical sensor  
1000-1101 = Reserved  
1110 = Error - Type of sensor cannot be determined (unknown sensor)  
1111 = not available

Data Length:	4 bits	
Resolution:	16 states/4 bit, 0 offset	
Data Range:	0 to 15	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64792	

**SPN 4930      Rear Collision Sensor 1 - Type**

Type of Rear Collision Sensor 1.

0000 = acceleration sensor  
0001 = pressure sensor  
0010 = rollrate sensor  
0011 = sonic sensor  
0100 = fiber-optic sensor  
0101 = radar sensor  
0110 = lidar sensor  
0111 = optical sensor  
1000-1101 = Reserved  
1110 = Error - Type of sensor cannot be determined (unknown sensor)  
1111 = not available

Data Length:	4 bits	
Resolution:	16 states/4 bit, 0 offset	
Data Range:	0 to 15	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64792	

**SPN 4931      Rear Collision Sensor 2 - Type**

Type of Rear Collision Sensor 2.

0000 = acceleration sensor  
0001 = pressure sensor  
0010 = rollrate sensor  
0011 = sonic sensor  
0100 = fiber-optic sensor  
0101 = radar sensor  
0110 = lidar sensor  
0111 = optical sensor  
1000-1101 = Reserved  
1110 = Error - Type of sensor cannot be determined (unknown sensor)  
1111 = not available

Data Length:	4 bits	
Resolution:	16 states/4 bit, 0 offset	
Data Range:	0 to 15	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64792	

**SPN 4932      Rear Collision Sensor 3 - Type**

Type of Rear Collision Sensor 3.

0000 = acceleration sensor  
0001 = pressure sensor  
0010 = rollrate sensor  
0011 = sonic sensor  
0100 = fiber-optic sensor  
0101 = radar sensor  
0110 = lidar sensor  
0111 = optical sensor  
1000-1101 = Reserved  
1110 = Error - Type of sensor cannot be determined (unknown sensor)  
1111 = not available

Data Length:	4 bits	
Resolution:	16 states/4 bit, 0 offset	
Data Range:	0 to 15	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64792	

**SPN 4933      Rear Collision Sensor 4 - Type**

Type of Rear Collision Sensor 4.

0000 = acceleration sensor  
0001 = pressure sensor  
0010 = rollrate sensor  
0011 = sonic sensor  
0100 = fiber-optic sensor  
0101 = radar sensor  
0110 = lidar sensor  
0111 = optical sensor  
1000-1101 = Reserved  
1110 = Error - Type of sensor cannot be determined (unknown sensor)  
1111 = not available

Data Length:	4 bits	
Resolution:	16 states/4 bit, 0 offset	
Data Range:	0 to 15	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64792	

**SPN 4934      Rollover Sensor - Type**

Type of Rollover Sensor.

0000 = acceleration sensor  
0001 = pressure sensor  
0010 = rollrate sensor  
0011 = sonic sensor  
0100 = fiber-optic sensor  
0101 = radar sensor  
0110 = lidar sensor  
0111 = optical sensor  
1000-1101 = Reserved  
1110 = Error - Type of sensor cannot be determined (unknown sensor)  
1111 = not available

Data Length:	4 bits	
Resolution:	16 states/4 bit, 0 offset	
Data Range:	0 to 15	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64792	

**SPN 4935      Frontal Collision Sensor 1 - Serial Number**

Serial Number of Frontal Collision Sensor 1.

Data Length:            Variable - up to 32 bytes followed by an "" delimiter  
Resolution:            ASCII, 0 offset  
Data Range:            0 to 255 per byte                      Operational Range: same as data range  
Type:                    Status  
Supporting Information:  
PGN reference:           64792

**SPN 4936      Frontal Collision Sensor 2 - Serial Number**

Serial Number of Frontal Collision Sensor 2.

Data Length:            Variable - up to 32 bytes followed by an "" delimiter  
Resolution:            ASCII, 0 offset  
Data Range:            0 to 255 per byte                      Operational Range: same as data range  
Type:                    Status  
Supporting Information:  
PGN reference:           64792

**SPN 4937      Frontal Collision Sensor 3 - Serial Number**

Serial Number of Frontal Collision Sensor 3.

Data Length:            Variable - up to 32 bytes followed by an "" delimiter  
Resolution:            ASCII, 0 offset  
Data Range:            0 to 255 per byte                      Operational Range: same as data range  
Type:                    Status  
Supporting Information:  
PGN reference:           64792

**SPN 4938      Frontal Collision Sensor 4 - Serial Number**

Serial Number of Frontal Collision Sensor 4.

Data Length:            Variable - up to 32 bytes followed by an "" delimiter  
Resolution:            ASCII, 0 offset  
Data Range:            0 to 255 per byte                      Operational Range: same as data range  
Type:                    Status  
Supporting Information:  
PGN reference:           64792

**SPN 4939      Side Collision Sensor Front Left - Serial Number**

Serial Number of Side Collision Sensor Front - Left.

Data Length:            Variable - up to 32 bytes followed by an "" delimiter  
Resolution:            ASCII, 0 offset  
Data Range:            0 to 255 per byte                      Operational Range: same as data range  
Type:                    Measured  
Supporting Information:  
PGN reference:        64792

**SPN 4940      Side Collision Sensor Mid Front Left - Serial Number**

Serial Number of Side Collision Sensor Mid Front - Left.

Data Length:            Variable - up to 32 bytes followed by an "" delimiter  
Resolution:            ASCII, 0 offset  
Data Range:            0 to 255 per byte                      Operational Range: same as data range  
Type:                    Measured  
Supporting Information:  
PGN reference:        64792

**SPN 4941      Side Collision Sensor Mid Rear Left - Serial Number**

Serial Number of Side Collision Sensor Mid Rear - Left.

Data Length:            Variable - up to 32 bytes followed by an "" delimiter  
Resolution:            ASCII, 0 offset  
Data Range:            0 to 255 per byte                      Operational Range: same as data range  
Type:                    Measured  
Supporting Information:  
PGN reference:        64792

**SPN 4942      Side Collision Sensor Rear Left - Serial Number**

Serial Number of Side Collision Sensor Rear - Left.

Data Length:            Variable - up to 32 bytes followed by an "" delimiter  
Resolution:            ASCII, 0 offset  
Data Range:            0 to 255 per byte                      Operational Range: same as data range  
Type:                    Measured  
Supporting Information:  
PGN reference:        64792

**SPN 4943      Side Collision Sensor Front Right - Serial Number**

Serial Number of Side Collision Sensor Front - Right.

Data Length:            Variable - up to 32 bytes followed by an "" delimiter  
Resolution:            ASCII, 0 offset  
Data Range:            0 to 255 per byte                      Operational Range: same as data range  
Type:                    Measured  
Supporting Information:  
PGN reference:           64792

**SPN 4944      Side Collision Sensor Mid Front Right - Serial Number**

Serial Number of Side Collision Sensor Mid Front - Right.

Data Length:            Variable - up to 32 bytes followed by an "" delimiter  
Resolution:            ASCII, 0 offset  
Data Range:            0 to 255 per byte                      Operational Range: same as data range  
Type:                    Measured  
Supporting Information:  
PGN reference:           64792

**SPN 4945      Side Collision Sensor Mid Rear Right - Serial Number**

Serial Number of Side Collision Sensor Mid Rear - Right.

Data Length:            Variable - up to 32 bytes followed by an "" delimiter  
Resolution:            ASCII, 0 offset  
Data Range:            0 to 255 per byte                      Operational Range: same as data range  
Type:                    Measured  
Supporting Information:  
PGN reference:           64792

**SPN 4946      Side Collision Sensor Rear Right - Serial Number**

Serial Number of Side Collision Sensor Rear - Right.

Data Length:            Variable - up to 32 bytes followed by an "" delimiter  
Resolution:            ASCII, 0 offset  
Data Range:            0 to 255 per byte                      Operational Range: same as data range  
Type:                    Measured  
Supporting Information:  
PGN reference:           64792

**SPN 4947      Rear Collision Sensor 1 - Serial Number**

Serial Number of Rear Collision Sensor 1.

Data Length:            Variable - up to 32 bytes followed by an "\*" delimiter  
Resolution:            ASCII, 0 offset  
Data Range:            0 to 255 per byte                      Operational Range: same as data range  
Type:                    Measured  
Supporting Information:  
PGN reference:           64792

**SPN 4948      Rear Collision Sensor 2 - Serial Number**

Serial Number of Rear Collision Sensor 2.

Data Length:            Variable - up to 32 bytes followed by an "\*" delimiter  
Resolution:            ASCII, 0 offset  
Data Range:            0 to 255 per byte                      Operational Range: same as data range  
Type:                    Measured  
Supporting Information:  
PGN reference:           64792

**SPN 4949      Rear Collision Sensor 3 - Serial Number**

Serial Number of Rear Collision Sensor 3.

Data Length:            Variable - up to 32 bytes followed by an "\*" delimiter  
Resolution:            ASCII, 0 offset  
Data Range:            0 to 255 per byte                      Operational Range: same as data range  
Type:                    Measured  
Supporting Information:  
PGN reference:           64792

**SPN 4950      Rear Collision Sensor 4 - Serial Number**

Serial Number of Rear Collision Sensor 4.

Data Length:            Variable - up to 32 bytes followed by an "\*" delimiter  
Resolution:            ASCII, 0 offset  
Data Range:            0 to 255 per byte                      Operational Range: same as data range  
Type:                    Measured  
Supporting Information:  
PGN reference:           64792



**SPN 4951      Rollover Sensor - Serial Number**

Serial Number of Rollover Sensor.

Data Length:	Variable - up to 32 bytes followed by an "*" delimiter	
Resolution:	ASCII, 0 offset	
Data Range:	0 to 255 per byte	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64792	

**SPN 4952      Driver Beltlock Status**

State of switch used to determine if Driver Beltlock is buckled.

00 = unlocked  
01 = locked  
10 = Error - Beltlock state cannot be determined  
11 = not available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64791	

**SPN 4953      Passenger Beltlock Status**

State of switch used to determine if Passenger Beltlock is buckled.

00 = unlocked  
01 = locked  
10 = Error - Beltlock state cannot be determined  
11 = not available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64791	

**SPN 4954*****Beltlock 3 Status***

State of switch used to determine if Beltlock 3 is buckled.

00 = unlocked

01 = locked

10 = Error - Beltlock state cannot be determined

11 = not available

Data Length: 2 bits

Resolution: 4 states/2 bit, 0 offset

Data Range: 0 to 3

Type: Status

Supporting Information:

PGN reference: 64791

Operational Range: same as data range

**SPN 4955*****Beltlock 4 Status***

State of switch used to determine if Beltlock 4 is buckled.

00 = unlocked

01 = locked

10 = Error - Beltlock state cannot be determined

11 = not available

Data Length: 2 bits

Resolution: 4 states/2 bit, 0 offset

Data Range: 0 to 3

Type: Status

Supporting Information:

PGN reference: 64791

Operational Range: same as data range

**SPN 4956*****Beltlock 5 Status***

State of switch used to determine if Beltlock 5 is buckled.

00 = unlocked

01 = locked

10 = Error - Beltlock state cannot be determined

11 = not available

Data Length: 2 bits

Resolution: 4 states/2 bit, 0 offset

Data Range: 0 to 3

Type: Status

Supporting Information:

PGN reference: 64791

Operational Range: same as data range

**SPN 4957*****Beltlock 6 Status***

State of switch used to determine if Beltlock 6 is buckled.

00 = unlocked

01 = locked

10 = Error - Beltlock state cannot be determined

11 = not available

Data Length: 2 bits

Resolution: 4 states/2 bit, 0 offset

Data Range: 0 to 3

Type: Status

Supporting Information:

PGN reference: 64791

Operational Range: same as data range

**SPN 4958*****Beltlock 7 Status***

State of switch used to determine if Beltlock 7 is buckled.

00 = unlocked

01 = locked

10 = Error - Beltlock state cannot be determined

11 = not available

Data Length: 2 bits

Resolution: 4 states/2 bit, 0 offset

Data Range: 0 to 3

Type: Status

Supporting Information:

PGN reference: 64791

Operational Range: same as data range

**SPN 4959*****Beltlock 8 Status***

State of switch used to determine if Beltlock 8 is buckled.

00 = unlocked

01 = locked

10 = Error - Beltlock state cannot be determined

11 = not available

Data Length: 2 bits

Resolution: 4 states/2 bit, 0 offset

Data Range: 0 to 3

Type: Status

Supporting Information:

PGN reference: 64791

Operational Range: same as data range

**SPN 4960*****Beltlock 9 Status***

State of switch used to determine if Beltlock 9 is buckled.

00 = unlocked  
01 = locked  
10 = Error - Beltlock state cannot be determined  
11 = not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 64791

Operational Range: same as data range

**SPN 4961*****Beltlock 10 Status***

State of switch used to determine if Beltlock 10 is buckled.

00 = unlocked  
01 = locked  
10 = Error - Beltlock state cannot be determined  
11 = not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 64791

Operational Range: same as data range

**SPN 4962*****Passenger Airbag Deactivation Switch Status***

State of switch used to deactivate Passenger Airbag manually.

00 = passenger airbag activated  
01 = passenger airbag deactivated  
10 = Error - State of deactivation switch cannot be determined  
11 = not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 64791

Operational Range: same as data range

**SPN 4963      *Driver Occupant Classification System Status***

State of Occupant Classification System for driver.

000 = empty  
001 = child  
010 = small adult  
011 = adult  
100 = large adult  
101 = reserved  
110 = Error - Classification of occupant cannot be determined  
111 = not available

Data Length:	3 bits	
Resolution:	8 states/3 bit, 0 offset	
Data Range:	0 to 7	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64790	

**SPN 4964      *Passenger Occupant Classification System Status***

State of Occupant Classification System for passenger.

000 = empty  
001 = child  
010 = small adult  
100 = reserved  
011 = adult  
100 = large adult  
101 = Error - Classification of occupant cannot be determined  
111 = not available

Data Length:	3 bits	
Resolution:	8 states/3 bit, 0 offset	
Data Range:	0 to 7	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64790	

**SPN 4965      Occupant Classification System 3 Status**

State of Occupant Classification System for seat position 3.

00 = empty  
01 = occupied  
10 = Error - Classification cannot be determined  
11 = not available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64790	

**SPN 4966      Occupant Classification System 4 Status**

State of Occupant Classification System for seat position 4.

00 = empty  
01 = occupied  
10 = Error - Classification cannot be determined  
11 = not available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64790	

**SPN 4967      Occupant Classification System 5 Status**

State of Occupant Classification System for seat position 5.

00 = empty  
01 = occupied  
10 = Error - Classification cannot be determined  
11 = not available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64790	

**SPN 4968      Occupant Classification System 6 Status**

State of Occupant Classification System for seat position 6.

00 = empty  
01 = occupied  
10 = Error - Classification cannot be determined  
11 = not available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64790	

**SPN 4969      Occupant Classification System 7 Status**

State of Occupant Classification System for seat position 7.

00 = empty  
01 = occupied  
10 = Error - Classification cannot be determined  
11 = not available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64790	

**SPN 4970      Occupant Classification System 8 Status**

State of Occupant Classification System for seat position 8.

00 = empty  
01 = occupied  
10 = Error - Classification cannot be determined  
11 = not available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64790	

**SPN 4971      Occupant Classification System 9 Status**

State of Occupant Classification System for seat position 9.

00 = empty  
01 = occupied  
10 = Error - Classification cannot be determined  
11 = not available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64790	

**SPN 4972      Occupant Classification System 10 Status**

State of Occupant Classification System for seat position 10.

00 = empty  
01 = occupied  
10 = Error - Classification cannot be determined  
11 = not available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64790	

**SPN 4973      Crash Type**

Type of crash event.

00001 = frontal crash  
00010 = rear crash  
00100 = side crash (left)  
01000 = side crash (right)  
10000 = rollover

It is possible to combine different Crash Types. (e.g. frontal and side crash (left) = 00101)

Data Length:	5 bits	
Resolution:	5 bit bit-mapped, 0 offset	
Data Range:	bit-mapped	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	61483	



**SPN 4974      Crash Counter**

The Crash Counter prevents other ECUs from reacting to a faulty transmission of the Crash Notification PGN and serves as a safety mechanism. The Crash Counter becomes incremented by 1 for every sent message, starting with "0". (15 follows 0)

Data Length:	4 bits	
Resolution:	1 count/bit, 0 offset	
Data Range:	0 to 15	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	61483	

**SPN 4975      Crash Checksum**

The Crash Checksum is used to verify the signal path from the airbag ECU to other devices in case of a crash.

The 4 bit checksum is the sum of the high nibble and the low nibble of the sum of the identifier, the first 7 data bytes and the 4 bit message counter. It is calculated as follows:

Checksum = (Byte1 + Byte2 + Byte3 + Byte4 + Byte5 + Byte6 + Byte7 + message counter&0x0F + message ID low byte + message ID mid low byte + message ID mid high byte + message ID high byte)

Checksum = ((Checksum >> 4) + Checksum) & 0x0F

Data Length:	4 bits	
Resolution:	1 count/bit, 0 offset	
Data Range:	0 to 15	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	61483	

**SPN 4976      Pitch Angle Extended Range**

The angle between the vehicle x-axis and the ground plane.

Data Length:	3 bytes	
Resolution:	1/32768 deg/bit, -250 deg offset	
Data Range:	-250 to 250.9999 deg	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	61481	

**SPN 4977      Roll Angle Extended Range**

The angle between the vehicle y-axis and the ground plane.

Data Length:	3 bytes	
Resolution:	1/32768 deg/bit, -250 deg offset	
Data Range:	-250 to 250.9999 deg	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	61481	

**SPN 4978      Pitch Angle Extended Range Compensation**

Compensated mode for the pitch measurement. Compensation is the use of multiple sensors together to enhance the output of the pitch measurement.

00 = On  
01 = Off  
10 = Error  
11 = Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        61481

Operational Range: same as data range

**(R) SPN 4979      Pitch Angle Extended Range Figure of Merit**

Figure of merit for pitch angle measurement.

00 = Pitch angle fully functional. Data is within sensor specification.  
01 = Pitch angle degraded. Data is suspect due to environmental conditions.  
10 = Error  
11 = Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        61481

Operational Range: same as data range

**(R) SPN 4980      Roll Angle Extended Range Compensation**

Compensated mode for the roll angle measurement. Compensation is the use of multiple sensors together to enhance the output of the roll angle measurement.

00 = On  
01 = Off  
10 = Error  
11 = Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        61481

Operational Range: same as data range

**(R) SPN 4981      Roll Angle Extended Range Figure of Merit**

Figure of merit for roll angle measurement.

00 = Roll angle fully functional. Data is within sensor specification.

01 = Roll angle degraded. Data is suspect due to environmental conditions.

10 = Error

11 = Not available

Data Length: 2 bits

Resolution: 4 states/2 bit, 0 offset

Data Range: 0 to 3

Type: Status

Supporting Information:

PGN reference: 61481

Operational Range: same as data range

**SPN 4982      Roll and Pitch Extended Range Measurement Latency**

Time between start of sensor processing and CAN transmission

Data Length: 1 byte

Resolution: 0.5 ms/bit, 0 offset

Data Range: 0 to 125 ms

Type: Measured

Supporting Information:

PGN reference: 61481

Operational Range: same as data range

**SPN 4983      Pitch Rate Extended Range**

Pitch rate is the rate-of-change of the pitch angle over time, where the pitch angle vector is in the direction of travel of the vehicle.

Data Length: 2 bytes

Resolution: 1/128 deg/sec per bit, -250 deg/sec offset

Data Range: -250 to 250.992 deg/sec

Type: Measured

Supporting Information:

PGN reference: 61482

Operational Range: same as data range

**SPN 4984      Roll Rate Extended Range**

Roll rate is the rate-of-change of the roll angle over time.

Data Length: 2 bytes

Resolution: 1/128 deg/sec per bit, -250 deg/sec offset

Data Range: -250 to 250.992 deg/sec

Type: Measured

Supporting Information:

PGN reference: 61482

Operational Range: same as data range

**SPN 4985      Yaw Rate Extended Range**

Yaw rate is the rate-of-change of the yaw angle over time.

Data Length:            2 bytes  
Resolution:            1/128 deg/sec per bit, -250 deg/sec offset  
Data Range:            -250 to 250.992 deg/sec      Operational Range: same as data range  
Type:                    Measured  
Supporting Information:  
PGN reference:           61482

**(R) SPN 4986      Pitch Rate Extended Range Figure of Merit**

Figure of merit for pitch rate measurement.

00 = Pitch rate fully functional. Data is within sensor specification.  
01 = Pitch rate degraded. Data is suspect due to environmental conditions.  
10 = Error  
11 = Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3      Operational Range: same as data range  
Type:                    Status  
Supporting Information:  
PGN reference:           61482

**(R) SPN 4987      Roll Rate Extended Range Figure of Merit**

Figure of merit for roll rate measurement.

00 = Roll rate fully functional. Data is within sensor specification.  
01 = Roll rate degraded. Data is suspect due to environmental conditions.  
10 = Error  
11 = Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3      Operational Range: same as data range  
Type:                    Status  
Supporting Information:  
PGN reference:           61482

**SPN 4988      Yaw Rate Extended Range Figure of Merit**

Figure of merit for yaw angle measurement.

00 = Yaw rate fully functional. Data is within sensor specification.  
01 = Yaw rate degraded. Data is suspect due to environmental conditions.  
10 = Error  
11 = Not available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	61482	

**SPN 4989      Angular Rate Measurement Latency**

The estimated measurement latency of the measurement.

NOTE: This is only the sensor latency and does not include any additional latencies that might exist because of the CAN Bus or overall system implementation. Latency is the time from sensor readings to the queuing of the message data for CAN transmission.

Data Length:	1 byte	
Resolution:	0.5 ms/bit, 0 offset	
Data Range:	0 to 125 ms	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	61482	

**SPN 4990      Battery Charger 1 State**

A state of the battery charger connected to the main battery.

0 - Idling. The power line or the battery is disconnected from the charger.  
1 - Charging the battery.  
2 - Stand-by or maintaining the battery charge.  
3 to 12 - Reserved  
13 - Battery failure. An error condition due to the battery state (high temperature, etc.)  
14 - Charger failure. An error condition due to the charger state.  
15 - Not available.

Data Length:	4 bits	
Resolution:	16 states/4 bit, 0 offset	
Data Range:	0 to 15	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64789	

**SPN 4991      Battery Charger 1 Power Line State**

A state of the battery charger connection to the power line for the charger connected to the main battery.

0 - Disconnected. The power line is disconnected from the charger.

1 - Connected. The power line is connected to the charger.

2 - Error

3 - Not available

Data Length: 2 bits

Resolution: 4 states/2 bit, 0 offset

Data Range: 0 to 3

Operational Range: same as data range

Type: Measured

Supporting Information:

PGN reference: 64789

**SPN 4992      Battery Charger 1 Output Voltage**

Output voltage measured on the battery terminals of the battery charger connected to the main battery.

Data Length: 2 bytes

Resolution: 0.05 V/bit, 0 offset

Data Range: 0 to 3212.75 V

Operational Range: same as data range

Type: Measured

Supporting Information:

PGN reference: 64789

**SPN 4993      Battery Charger 1 Output Current**

Output current of the battery charger connected to the main battery. If positive, this parameter shows the charging current of the battery charger connected to the main battery. Otherwise, if the charger hardware permits, this parameter represents the current consumed by the battery charger ECU from the main battery.

Data Length: 2 bytes

Resolution: 0.05 A/bit, -1600 A offset

Data Range: -1600 to 1612.75 A

Operational Range: same as data range

Type: Measured

Supporting Information:

PGN reference: 64789

**SPN 4994      Battery Charger 2 State**

A state of the offline battery charger connected to the auxiliary battery.

- 0 - Idling. The power line or the battery is disconnected from the charger.
- 1 - Charging the battery.
- 2 - Stand-by or maintaining the battery charge.
- 3 to 12 - Reserved
- 13 - Battery failure. An error condition due to the battery state (high temperature, etc.)
- 14 - Charger failure. An error condition due to the charger state.
- 15 - Not available.

Data Length:	4 bits	
Resolution:	16 states/4 bit, 0 offset	
Data Range:	0 to 15	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64788	

**SPN 4995      Battery Charger 2 Power Line State**

A state of the battery charger connection to the power line for the charger connected to the auxiliary battery.

- 0 - Disconnected. The power line is disconnected from the charger.
- 1 - Connected. The power line is connected to the charger.
- 2 - Error
- 3 - Not available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64788	

**SPN 4996      Battery Charger 2 Output Voltage**

Output voltage measured on the battery terminals of the offline battery charger connected to the auxiliary battery.

Data Length:	2 bytes	
Resolution:	0.05 V/bit, 0 offset	
Data Range:	0 to 3212.75 V	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64788	

**SPN 4997      Battery Charger 2 Output Current**

Output current of the battery charger connected to the main battery. If positive, this parameter shows the charging current of the battery charger connected to the main battery. Otherwise, if the charger hardware permits, this parameter represents the current consumed by the battery charger ECU from the main battery.

Data Length:	2 bytes	
Resolution:	0.05 A/bit, -1600 A offset	
Data Range:	-1600 to 1612.75 A	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64788	

**SPN 4998      Magnet Boost Time**

The duration of time after the activation of the magnet circuit that a relatively high current is sent to the magnet for material pick up operations. This time is called boost time. After the boost time expires, a lower operation current is sent to the magnet to hold the material.

Data Length:	1 byte	
Resolution:	0.25 s/bit, 0 offset	
Data Range:	0 to 62.5 s	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64787	

**SPN 4999      Magnet Rated Power**

The rated power that the magnet can accept during material holding operations. Note that the magnet may experience more power over short intervals, such as during initial activation of the magnet circuit to pick up material.

Data Length:	2 bytes	
Resolution:	0.5 kW/bit, 0 offset	
Data Range:	0 to 32,127.5 kW	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64787	

**SPN 5000      Generator Overheat Status**

The Status of Generator being Overheated.

00 = Not Overheat  
01 = Overheat  
10 = Error  
11 = Not Available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64786	



**SPN 5001      Genset System Output Voltage Range Status**

Status of generator voltage in or out of desired operating range.

00 = Out of Range  
01 = In Range  
10 = Error  
11 = Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64786

Operational Range: same as data range

**SPN 5002      Reverse Current Range Setting**

The operator setting for the Reverse Current. The setting defines the maximum reverse current. The actual current limits are specific to the application.

00000 = 1  
00001 = 2  
00010 = 3  
00011 = 4  
00100 = 5  
00101 = 6  
00110 = 7  
00111 = 8  
01000 = 9  
01001 = 10  
01010 = 11  
01011 = 12  
01100 = 13  
01101 = 14  
01110 = 15  
01111 = 16  
10000-11101 = Not used  
11110 = Error  
11111 = Not Available

Data Length:            5 bits  
Resolution:            32 states/5 bit, 0 offset  
Data Range:            0 to 31  
Type:                    Status  
Supporting Information:  
PGN reference:        64786

Operational Range: same as data range

**SPN 5003      Grapple/Magnet Selection Switch**

This is a switch that can be used to select either the Grapple or Magnet function of the material handler machine.

00 = Grapple Selected  
01 = Magnet Selected  
10 = Error  
11 = Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64786

Operational Range: same as data range

**SPN 5004      Genset Softstart Active Status**

The Genset Softstart Active Status refers to the status of the genset softstart relay. The moment the Genset System is started, this relay is activated. As a result, the hydraulic power is hold on for a short period of time, and this relay will be turned off once the genset hydraulic power become stable.

00 = Off  
01 = On  
10 = Error  
11 = Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64786

Operational Range: same as data range

**SPN 5005      Genset Enable Active Status**

Status of the Genset Enable Relay that enables or disables the Genset.

00 = Not Enabled  
01 = Enabled  
10 = Error  
11 = Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64786

Operational Range: same as data range

**SPN 5006 Voltage Monitor Active Status**

Status of Voltage Monitor Relay. When it is activated, the Generator Voltage Monitor is connected to the generator output line so that the generator output voltage range could be monitored.

00 = Monitor is Off  
01 = Monitor is On  
10 = Error  
11 = Not Available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 64786

Operational Range: same as data range

**SPN 5007 Generator Duty Cycle Exceeded Status**

The status of the duty cycle of the generator usage, indicating if the generator has been on for too much time within a defined time window. The duty cycle is the ratio of the time the generator is on and the time the generator is off within a time window.

00 = Duty Cycle Not Exceed  
01 = Duty Cycle Exceed  
10 = Error  
11 = Not Available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 64786

Operational Range: same as data range

**SPN 5008 Magnet Forward Current**

The forward current being supplied by the generator to the electric magnet to create a magnet field to lift material.

Data Length: 2 bytes  
Resolution: 1 A/bit, 0 offset  
Data Range: 0 to 64,255 Amps  
Type: Status  
Supporting Information:  
PGN reference: 61484

Operational Range: same as data range

**SPN 5009      *Magnet Reverse Current***

A reverse current being supplied to the electric magnet to reduce the forward current generated magnet field as quick as possible so that the magnet can release material as fast as possible.

Data Length:	1 byte	
Resolution:	1 A/bit, 0 offset	
Data Range:	0 to 250 A	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	61484	

**SPN 5010      *Material Lift Switch***

This is a switch that can be used to enable the lift functionality of the Material Handler machine. When it is activated, the magnet is energized to pick up material.

00 = Don't Lift  
01 = Lift  
10 = Error  
11 = Not Available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	61484	

**SPN 5011      *Material Drop Switch***

This is a switch that can be used to enable the drop functionality of the Material Handler machine.

00 = Don't Drop  
01 = Drop  
10 = Error  
11 = Not Available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	61484	

**SPN 5012      Generator Current Boost Active Status**

Status of generator current boost relay that can boost the generator output current for picking-up material operations. When this relay is "on", the generator is generating the maximum current for the material handler machine to pick-up material. When the relay is off, the generator is generating normal current for the material handler machine to hold material.

00 = Off  
01 = On  
10 = Error  
11 = Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        61484

Operational Range: same as data range

**SPN 5013      Material Lift Active Status**

The status of Material Lift Relay. When it is on, the generator generates forward direction current so that the material handler machine can pick up material.

00 = Off  
01 = On  
10 = Error  
11 = Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        61484

Operational Range: same as data range

**SPN 5014      Material Drop Active Status**

The status of Material Drop Relay. When it is on, the generator generates reverse direction current so that the material handler machine can release material.

00 = Off  
01 = On  
10 = Error  
11 = Not Available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        61484

Operational Range: same as data range

**SPN 5015      *Momentary Engine Maximum Power Enable***

Momentarily Requesting highest torque map from the engine control

00 not requesting maximum power available  
01 momentarily requesting maximum power available  
10 fault  
11 not available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	61442	

**(R) SPN 5019      *Engine Exhaust Gas Recirculation 1 Outlet Pressure***

EGR outlet pressure is measured immediately after the EGR valve.

Data Length:	1 byte	
Resolution:	2 kPa/bit, 0 offset	
Data Range:	0 to 500 kPa	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64961	

**(R) SPN 5020      *Engine Exhaust Gas Recirculation 1 Mixer Intake Temperature***

The temperature of the EGR gas entering the intake mixer, measured after the intake throttle when provided.

Data Length:	2 bytes	
Resolution:	0.03125 deg C/bit, -273 deg C offset	
Data Range:	-273 to 1734.96875 deg C	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64870	

**SPN 5021      *Momentary Engine Maximum Power Enable Feedback***

Momentarily requesting Engine Maximum Power Enable - feature support feedback

00 disabled  
01 supported  
10 reserved  
11 don't care

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	61443	

**SPN 5022      *Forward Collision Warning***

This parameter indicates if a collision is imminent and strong driver reaction either by braking hard or by an avoidance maneuver are imperative to prevent a collision.

00 No warning  
01 Collision is imminent  
10 Error indicator  
11 not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65135

Operational Range: same as data range

**SPN 5023      *ACC usage demand***

This parameter indicates the drivers demand to activate or deactivate ACC keeping distance control.

00 driver demand for not using ACC distance keeping control  
01 driver demand for using ACC distance keeping control  
10 reserved  
11 don't care

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65105

Operational Range: same as data range

**SPN 5024      *Aftertreatment 1 Intake Gas NOx Sensor Heater Ratio***

Heater ratio to determine temperature at sensor tip.

Data Length:            2 bytes  
Resolution:            0.001/bit, 0 offset  
Data Range:            0 to 64.255  
Type:                    Measured  
Supporting Information:  
PGN reference:        64785

Operational Range: same as data range

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**SPN 5025      *Aftertreatment 1 Intake Gas NOx Sensor New part deviation NOx Gain***

New part deviation NOx\_Gain to correct (recalculate) sensor signal on the Engine ECU side.

Data Length: 2 bytes  
Resolution: 0.1 %/bit, -100 offset  
Data Range: -100 to 100 %      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 64785

**SPN 5026      *Aftertreatment 1 Intake Gas NOx Sensor New part deviation NOx Offset***

New part deviation NOx\_Offset to correct (recalculate) sensor signal on the Engine ECU side.

Data Length: 1 byte  
Resolution: 1 ppm/bit, -125 ppm offset  
Data Range: -125 to 125 ppm      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 64785

**SPN 5027      *Aftertreatment 1 Intake Gas NOx Sensor Correction of pressure Lambda***

Correction of pressure Lambda-signal to correct (recalculate) sensor signal on the Engine ECU side.

Data Length: 1 byte  
Resolution: 0.5%/bar per bit, 0 offset  
Data Range: 0 to 125%/bar      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 64784

**SPN 5028      *Aftertreatment 1 Intake Gas NOx Sensor Correction of pressure Nox***

Correction of pressure NOx-signal to correct (recalculate) sensor signal on the Engine ECU side.

Data Length: 1 byte  
Resolution: 0.5%/bar per bit, 0 offset  
Data Range: 0 to 125%/bar      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 64784



**SPN 5029      *Aftertreatment 1 Intake Gas NOx Sensor NO2 Correction***

Correction of NO2 at the NOx-signal to correct (recalculate) sensor signal on the Engine ECU side.

Data Length:	1 byte	
Resolution:	0.5%/bit, 0 offset	
Data Range:	0 to 125%	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64784	

**SPN 5030      *Aftertreatment 1 Intake Gas NOx Sensor NH3 Correction***

Correction of NH3 at the NOx-signal to correct (recalculate) sensor signal on the Engine ECU side.

Data Length:	1 byte	
Resolution:	0.5%/bit, 0 offset	
Data Range:	0 to 125%	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64784	

**SPN 5031      *Aftertreatment 1 Outlet Gas NOx Sensor Heater Ratio***

Heater ratio to determine temperature at sensor tip.

Data Length:	2 bytes	
Resolution:	0.001/bit, 0 offset	
Data Range:	0 to 64.255	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64783	

**SPN 5032      *Aftertreatment 1 Outlet Gas NOx Sensor New part deviation NOx Gain***

New part deviation NOx\_Gain to correct (recalculate) sensor signal on the Engine ECU side.

Data Length:	2 bytes	
Resolution:	0.1 %/bit, -100 offset	
Data Range:	-100 to 100 %	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64783	

**SPN 5033      *Aftertreatment 1 Outlet Gas NOx Sensor New part deviation NOx Offset***

New part deviation NOx\_Offset to correct (recalculate) sensor signal on the Engine ECU side.

Data Length:	1 byte	
Resolution:	1 ppm/bit, -125 ppm offset	
Data Range:	-125 to 125 ppm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64783	

**SPN 5034      *Aftertreatment 1 Outlet Gas NOx Sensor Correction of pressure Lambda***

Correction of pressure Lambda-signal to correct (recalculate) sensor signal on the Engine ECU side.

Data Length:	1 byte	
Resolution:	0.5%/bar per bit, 0 offset	
Data Range:	0 to 125%/bar	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64782	

**SPN 5035      *Aftertreatment 1 Outlet Gas NOx Sensor Correction of pressure Nox***

Correction of pressure NOx-signal to correct (recalculate) sensor signal on the Engine ECU side.

Data Length:	1 byte	
Resolution:	0.5%/bar per bit, 0 offset	
Data Range:	0 to 125%/bar	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64782	

**SPN 5036      *Aftertreatment 1 Outlet Gas NOx Sensor NO2 Correction***

Correction of NO2 at the NOx-signal to correct (recalculate) sensor signal on the Engine ECU side.

Data Length:	1 byte	
Resolution:	0.5%/bit, 0 offset	
Data Range:	0 to 125%	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64782	

**SPN 5037      *Aftertreatment 1 Outlet Gas NOx Sensor NH3 Correction***

Correction of NH3 at the NOx-signal to correct (recalculate) sensor signal on the Engine ECU side.

Data Length:	1 byte	
Resolution:	0.5%/bit, 0 offset	
Data Range:	0 to 125%	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64782	

**SPN 5038      *Aftertreatment 2 Intake Gas NOx Sensor Heater Ratio***

Heater ratio to determine temperature at sensor tip.

Data Length:	2 bytes	
Resolution:	0.001/bit, 0 offset	
Data Range:	0 to 64.255	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64781	

**SPN 5039      *Aftertreatment 2 Intake Gas NOx Sensor New part deviation NOx Gain***

New part deviation NOx\_Gain to correct (recalculate) sensor signal on the Engine ECU side.

Data Length:	2 bytes	
Resolution:	0.1 %/bit, -100 offset	
Data Range:	-100 to 100 %	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64781	

**SPN 5040      *Aftertreatment 2 Intake Gas NOx Sensor New part deviation NOx Offset***

New part deviation NOx\_Offset to correct (recalculate) sensor signal on the Engine ECU side.

Data Length:	1 byte	
Resolution:	1 ppm/bit, -125 ppm offset	
Data Range:	-125 to 125 ppm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64781	

**SPN 5041      *Aftertreatment 2 Intake Gas NOx Sensor Correction of pressure Lambda***

Correction of pressure Lambda-signal to correct (recalculate) sensor signal on the Engine ECU side.

Data Length:	1 byte	
Resolution:	0.5%/bar per bit, 0 offset	
Data Range:	0 to 125%/bar	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64780	

**SPN 5042      *Aftertreatment 2 Intake Gas NOx Sensor Correction of pressure Nox***

Correction of pressure NOx-signal to correct (recalculate) sensor signal on the Engine ECU side.

Data Length:	1 byte	
Resolution:	0.5%/bar per bit, 0 offset	
Data Range:	0 to 125%/bar	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64780	

**SPN 5043      *Aftertreatment 2 Intake Gas NOx Sensor NO2 Correction***

Correction of NO2 at the NOx-signal to correct (recalculate) sensor signal on the Engine ECU side.

Data Length:	1 byte	
Resolution:	0.5%/bit, 0 offset	
Data Range:	0 to 125%	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64780	

**SPN 5044      *Aftertreatment 2 Intake Gas NOx Sensor NH3 Correction***

Correction of NH3 at the NOx-signal to correct (recalculate) sensor signal on the Engine ECU side.

Data Length:	1 byte	
Resolution:	0.5%/bit, 0 offset	
Data Range:	0 to 125%	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64780	

**SPN 5045      *Aftertreatment 2 Outlet Gas NOx Sensor Heater Ratio***

Heater ratio to determine temperature at sensor tip.

Data Length:	2 bytes	
Resolution:	0.001/bit, 0 offset	
Data Range:	0 to 64.255	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64779	

**SPN 5046      *Aftertreatment 2 Outlet Gas NOx Sensor New part deviation NOx Gain***

New part deviation NOx\_Gain to correct (recalculate) sensor signal on the Engine ECU side.

Data Length:	2 bytes	
Resolution:	0.1 %/bit, -100 offset	
Data Range:	-100 to 100 %	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64779	

**SPN 5047      *Aftertreatment 2 Outlet Gas NOx Sensor New part deviation NOx Offset***

New part deviation NOx\_Offset to correct (recalculate) sensor signal on the Engine ECU side.

Data Length:	1 byte	
Resolution:	1 ppm/bit, -125 ppm offset	
Data Range:	-125 to 125 ppm	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64779	

**SPN 5048      *Aftertreatment 2 Outlet Gas NOx Sensor Correction of pressure Lambda***

Correction of pressure Lambda-signal to correct (recalculate) sensor signal on the Engine ECU side.

Data Length:	1 byte	
Resolution:	0.5%/bar per bit, 0 offset	
Data Range:	0 to 125%/bar	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64778	

**SPN 5049      *Aftertreatment 2 Outlet Gas NOx Sensor Correction of pressure Nox***

Correction of pressure NOx-signal to correct (recalculate) sensor signal on the Engine ECU side.

Data Length:	1 byte	
Resolution:	0.5%/bar per bit, 0 offset	
Data Range:	0 to 125%/bar	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64778	

**SPN 5050      *Aftertreatment 2 Outlet Gas NOx Sensor NO2 Correction***

Correction of NO2 at the NOx-signal to correct (recalculate) sensor signal on the Engine ECU side.

Data Length:	1 byte	
Resolution:	0.5%/bit, 0 offset	
Data Range:	0 to 125%	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64778	

**SPN 5051      *Aftertreatment 2 Outlet Gas NOx Sensor NH3 Correction***

Correction of NH3 at the NOx-signal to correct (recalculate) sensor signal on the Engine ECU side.

Data Length:	1 byte	
Resolution:	0.5%/bit, 0 offset	
Data Range:	0 to 125%	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64778	

**SPN 5052      *Transmission Clutch/Converter Input Speed***

Rotational velocity of the input to a transmission's master clutch or torque converter. In most cases the rotational velocity will be the same as engine flywheel speed unless there is an intermediate device, such as a power divider, between the engine and the clutch/converter.

Data Length:	2 bytes	
Resolution:	0.125 rpm/bit, 0 offset	
Data Range:	0 to 8,031.875 rpm	Operational Range: same as data range
Type:	Measured	
Supporting Information:	See Appendix D - SPN 5052	
PGN reference:	61452	

**(R) SPN 5053      High Resolution Engine Trip Fuel**

Fuel consumed during all or part of a journey. High resolution used for calculations and fleet management systems. See SPN 182 for alternate resolution.

Data Length:	4 bytes	
Resolution:	0.001 L/bit, 0 offset	
Data Range:	0 to 4,211,081.215 L	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64777	

**(R) SPN 5054      High Resolution Engine Total Fuel Used**

Accumulated amount of fuel used during vehicle operation. High resolution used for calculations and fleet management systems. See SPN 250 for alternate resolution.

Data Length:	4 bytes	
Resolution:	0.001 L/bit, 0 offset	
Data Range:	0 to 4,211,081.215 L	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64777	

**(R) SPN 5055      Engine Oil Viscosity**

Dynamic viscosity of the engine oil

Data Length:	2 bytes	
Resolution:	0.015625 Cp per bit, 0 offset	
Data Range:	0 to 1003.984375 Cp	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64776	

**(R) SPN 5056      Engine Oil Density**

Density of the engine oil

Data Length:	2 bytes	
Resolution:	0.00003052 g/cc per bit, 0 offset	
Data Range:	0 to 1.961 g/cc	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64776	

**(R) SPN 5057 Cab Noise Control Command**

Command signal to change the state of the Cab Noise Control System to on-line or off-line

- 00 - Take Cab Noise Control System Off Line
- 01 - Bring Cab Noise Control System On Line
- 10 - Reserved
- 11 - Don't Care/Not Commanded

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 38912

Operational Range: same as data range

**(R) SPN 5058 Cab Noise Control Tuning Command**

Command values for the Tuning State of the Cab Noise Control System. The Tuning State allows the Cab Noise Control System to adjust certain system characteristics (e.g. to account for microphone or speaker degradation over time).

- 000 - Activate Manual Tuning, Wait for Save and Exit Commands
- 001 - Activate Automatic Tuning, Wait for Save and Exit Commands
- 010 - Activate Automatic Tuning State, Saving Parameters, Exit on Completion
- 011 - Remain In Tuning, Save Current Parameters
- 100 - Exit Tuning, Not Saving Parameters
- 101 - Exit Tuning, Saving Parameters
- 110 - Reserved
- 111 - Don't Care, NOT Commanded

Data Length: 3 bits  
Resolution: 8 states/3 bit, 0 offset  
Data Range: 0 to 7  
Type: Status  
Supporting Information:  
PGN reference: 38912

Operational Range: same as data range

**(R) SPN 5059 Cab Noise Control Status**

This parameter returns the current status of the Cab Noise Control system.

- 00 - Cab Noise Control System ON-Line
- 01 - Cab Noise Control System OFF-Line
- 10 - Error Indicator
- 11 - Not Available/Not Requested

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 38656

Operational Range: same as data range



**(R) SPN 5060 Cab Noise Control Tuning Status**

This parameter returns the current status of tuning function of the Cab Noise Control system. When the tuning state is active, the Cab Noise Control System adjusts certain system characteristics (e.g. to account for sensor and/or transducer degradation over time). This adjustment may be automatic or under manual control.

0000 – Manual Tuning Mode  
0001 – Manual Tuning Mode – Command Complete  
0010 – Manual Tuning Mode – Saving Data  
0011 – Reserved  
0100 – Reserved  
0101 – Reserved  
0110 – Reserved  
0111 – Manual Tuning Denied – Requires Security Verification  
1000 – Automatic Tuning Mode  
1001 – Automatic Tuning Mode – Command Complete  
1010 – Automatic Tuning Mode – Saving Data  
1011 – Reserved  
1100 – Reserved  
1101 – Reserved  
1110 – Tuning Mode – Error  
1111 – Not Available/Not Tuning/Not Requested

Data Length:	4 bits	
Resolution:	16 states/4 bit, 0 offset	
Data Range:	0 to 15	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	38656	

**(R) SPN 5077 Engine Protect Lamp Command**

Command signal directly controlling the Engine Protect Lamp

00 - Lamp Off  
01 - Lamp On  
10 - Reserved  
11 - Not available

Note: SPN 987 should be used for reporting diagnostics of the Engine Protect Lamp.

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64775	

**(R) SPN 5078      Engine Amber Warning Lamp Command**

Command signal directly controlling the Engine Amber Warning Lamp

00 - Lamp Off  
01 - Lamp On  
10 - Reserved  
11 - Not available

Note: SPN 624 should be used for reporting diagnostics of the Engine Amber Warning Lamp.

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64775	

**(R) SPN 5079      Engine Red Stop Lamp Command**

Command signal directly controlling the Engine Red Stop Lamp

00 - Lamp Off  
01 - Lamp On  
10 - Reserved  
11 - Not available

Note: SPN 623 should be used for reporting diagnostics of the Engine Red Stop Lamp.

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64775	

**(R) SPN 5080      OBD Malfunction Indicator Lamp Command**

Command signal directly controlling the OBD Malfunction Indicator Lamp

00 - Lamp Off  
01 - Lamp On  
10 - Reserved  
11 - Not available

Note: SPN 1213 should be used for reporting diagnostics of the OBD Malfunction Indicator Lamp.

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64775	

**(R) SPN 5081      Engine Brake Active Lamp Command**

Command signal directly controlling the Engine Brake Active Lamp

00 - Lamp Off  
01 - Lamp On  
10 - Reserved  
11 - Not available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64775	

**(R) SPN 5082      Engine Oil Pressure Low Lamp Command**

Command signal directly controlling the Engine Oil Pressure Low Lamp

00 - Lamp Off  
01 - Lamp On  
10 - Reserved  
11 - Not available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64775	

**(R) SPN 5083      Engine Coolant Temperature High Lamp Command**

Command signal directly controlling the Engine Coolant Temperature High Lamp

00 - Lamp Off  
01 - Lamp On  
10 - Reserved  
11 - Not available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64775	

**(R) SPN 5084      Engine Coolant Level Low Lamp Command**

Command signal directly controlling the Engine Coolant Level Low Lamp

00 - Lamp Off  
01 - Lamp On  
10 - Reserved  
11 - Not available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64775	

**(R) SPN 5085      Engine Idle Management Active Lamp Command**

Command signal directly controlling the Engine Idle Management Active Lamp

00 - Lamp Off  
01 - Lamp On  
10 - Reserved  
11 - Not available

Note: SPN 1661 should be used for reporting diagnostics of the Engine Idle Management Active Lamp.

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64775	

**(R) SPN 5086      Engine Air Filter Restriction Lamp Command**

Command signal directly controlling the Engine Air Filter Restriction Lamp.

00 - Lamp Off  
01 - Lamp On  
10 - Reserved  
11 - Not available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64775	

**(R) SPN 5087      Vehicle Battery Voltage Low Lamp Command**

Command signal directly controlling the Vehicle Battery Voltage Low Lamp.

00 - Lamp Off  
01 - Lamp On  
10 - Reserved  
11 - Not available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64774	

**(R) SPN 5088      Vehicle Fuel Level Low Lamp Command**

Command signal directly controlling the Vehicle Fuel Level Low Lamp.

00 - Lamp Off  
01 - Lamp On  
10 - Reserved  
11 - Not available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64774	

**(R) SPN 5089      Vehicle Air Pressure Low Lamp Command**

Command signal directly controlling the Vehicle Air Pressure Low Lamp.

00 - Lamp Off  
01 - Lamp On  
10 - Reserved  
11 - Not available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64774	

**(R) SPN 5090      Vehicle HVAC Recirculation Lamp Command**

Command signal directly controlling the Vehicle HVAC Recirculation Lamp.

00 - Lamp Off  
01 - Lamp On  
10 - Reserved  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64774

Operational Range: same as data range

**(R) SPN 5091      Vehicle Battery Charging Lamp Command**

Command signal directly controlling the Vehicle Battery Charging Lamp.

00 - Lamp Off  
01 - Lamp On  
10 - Reserved  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64774

Operational Range: same as data range

**(R) SPN 5093      Engine Protect Lamp Data**

This parameter provides measured data from the Engine Protect Lamp.

00 - Lamp deactivated (Off)  
01 - Lamp activated (On)  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64773

Operational Range: same as data range

.....

**(R) SPN 5094      Engine Amber Warning Lamp Data**

This parameter provides measured data from the Engine Amber Warning Lamp.

00 - Lamp deactivated (Off)  
01 - Lamp activated (On)  
10 - Error  
11 - Not available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64773	

**(R) SPN 5095      Engine Red Stop Lamp Data**

This parameter provides measured data from the Engine Red Stop Lamp.

00 - Lamp deactivated (Off)  
01 - Lamp activated (On)  
10 - Error  
11 - Not available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64773	

**(R) SPN 5096      OBD Malfunction Indicator Lamp Data**

This parameter provides measured data from the OBD Malfunction Indicator Lamp.

00 - Lamp deactivated (Off)  
01 - Lamp activated (On)  
10 - Error  
11 - Not available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64773	

**(R) SPN 5097      Engine Brake Active Lamp Data**

This parameter provides measured data from the Engine Brake Active Lamp.

00 - Lamp deactivated (Off)  
01 - Lamp activated (On)  
10 - Error  
11 - Not available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64773	

**(R) SPN 5098      Compression Brake Enable Switch Indicator Lamp Data**

This parameter provides measured data from the Compression Brake Enable Switch Indicator Lamp.

00 - Lamp deactivated (Off)  
01 - Lamp activated (On)  
10 - Error  
11 - Not available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64773	

**(R) SPN 5099      Engine Oil Pressure Low Lamp Data**

This parameter provides measured data from the Engine Oil Pressure Low Lamp.

00 - Lamp deactivated (Off)  
01 - Lamp activated (On)  
10 - Error  
11 - Not available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64773	



**(R) SPN 5100      Engine Coolant Temperature High Lamp Data**

This parameter provides measured data from the Engine Coolant Temperature High Lamp.

00 - Lamp deactivated (Off)  
01 - Lamp activated (On)  
10 - Error  
11 - Not available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64773	

**(R) SPN 5101      Engine Coolant Level Low Lamp Data**

This parameter provides measured data from the Engine Coolant Level Low Lamp.

00 - Lamp deactivated (Off)  
01 - Lamp activated (On)  
10 - Error  
11 - Not available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64773	

**(R) SPN 5102      Engine Idle Management Active Lamp Data**

This parameter provides measured data from the Engine Idle Management Active Lamp.

00 - Lamp deactivated (Off)  
01 - Lamp activated (On)  
10 - Error  
11 - Not available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64773	

**(R) SPN 5103      Engine Air Filter Restriction Lamp Data**

This parameter provides measured data from the Engine Air Filter Restriction Lamp.

00 - Lamp deactivated (Off)

01 - Lamp activated (On)

10 - Error

11 - Not available

Data Length: 2 bits

Resolution: 4 states/2 bit, 0 offset

Data Range: 0 to 3

Operational Range: same as data range

Type: Measured

Supporting Information:

PGN reference: 64773

**(R) SPN 5104      Vehicle Battery Voltage Low Lamp Data**

This parameter provides measured data from the Vehicle Battery Voltage Low Lamp.

00 - Lamp deactivated (Off)

01 - Lamp activated (On)

10 - Error

11 - Not available

Data Length: 2 bits

Resolution: 4 states/2 bit, 0 offset

Data Range: 0 to 3

Operational Range: same as data range

Type: Measured

Supporting Information:

PGN reference: 64772

**(R) SPN 5105      Vehicle Fuel Level Low Lamp Data**

This parameter provides measured data from the Vehicle Fuel Level Low Lamp.

00 - Lamp deactivated (Off)

01 - Lamp activated (On)

10 - Error

11 - Not available

Data Length: 2 bits

Resolution: 4 states/2 bit, 0 offset

Data Range: 0 to 3

Operational Range: same as data range

Type: Measured

Supporting Information:

PGN reference: 64772

**(R) SPN 5106      Vehicle Air Pressure Low Lamp Data**

This parameter provides measured data from the Vehicle Air Pressure Low Lamp.

00 - Lamp deactivated (Off)  
01 - Lamp activated (On)  
10 - Error  
11 - Not available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64772	

**(R) SPN 5107      Vehicle HVAC Recirculation Lamp Data**

This parameter provides measured data from the Vehicle HVAC Recirculation Lamp.

00 - Lamp deactivated (Off)  
01 - Lamp activated (On)  
10 - Error  
11 - Not available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64772	

**(R) SPN 5108      Vehicle Battery Charging Lamp Data**

This parameter provides measured data from the Vehicle Battery Charging Lamp.

00 - Lamp deactivated (Off)  
01 - Lamp activated (On)  
10 - Error  
11 - Not available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64772	

**(R) SPN 5125      Sensor supply voltage 7**

Sensor ECU supply voltage 7

Data Length:	2 bytes	
Resolution:	0.05 V/bit, 0 offset	
Data Range:	0 to 3212.75 V	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64924	

**(R) SPN 5126      Sensor supply voltage 8**

Sensor ECU supply voltage 8

Data Length:	2 bytes	
Resolution:	0.05 V/bit, 0 offset	
Data Range:	0 to 3212.75 V	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64924	

**(R) SPN 5127      Sensor supply voltage 9**

Sensor ECU supply voltage 9

Data Length:	2 bytes	
Resolution:	0.05 V/bit, 0 offset	
Data Range:	0 to 3212.75 V	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:		

**(R) SPN 5128      Sensor supply voltage 10**

Sensor ECU supply voltage 10

Data Length:	2 bytes	
Resolution:	0.05 V/bit, 0 offset	
Data Range:	0 to 3212.75 V	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:		

**(R) SPN 5129      Sensor supply voltage 11**

Sensor ECU supply voltage 11

Data Length: 2 bytes  
Resolution: 0.05 V/bit, 0 offset  
Data Range: 0 to 3212.75 V  
Type: Measured  
Supporting Information:  
PGN reference:

Operational Range: same as data range

**(R) SPN 5130      Sensor supply voltage 12**

Sensor ECU supply voltage 12

Data Length: 2 bytes  
Resolution: 0.05 V/bit, 0 offset  
Data Range: 0 to 3212.75 V  
Type: Measured  
Supporting Information:  
PGN reference:

Operational Range: same as data range

**(R) SPN 5131      Sensor supply voltage 13**

Sensor ECU supply voltage 13

Data Length: 2 bytes  
Resolution: 0.05 V/bit, 0 offset  
Data Range: 0 to 3212.75 V  
Type: Measured  
Supporting Information:  
PGN reference:

Operational Range: same as data range

**(R) SPN 5132      Sensor supply voltage 14**

Sensor ECU supply voltage 14

Data Length: 2 bytes  
Resolution: 0.05 V/bit, 0 offset  
Data Range: 0 to 3212.75 V  
Type: Measured  
Supporting Information:  
PGN reference:

Operational Range: same as data range

**(R) SPN 5133      Sensor supply voltage 15**

Sensor ECU supply voltage 15

Data Length: 2 bytes  
Resolution: 0.05 V/bit, 0 offset  
Data Range: 0 to 3212.75 V  
Type: Measured  
Supporting Information:  
PGN reference:

Operational Range: same as data range

**(R) SPN 5134      Sensor supply voltage 16**

Sensor ECU supply voltage 16

Data Length: 2 bytes  
Resolution: 0.05 V/bit, 0 offset  
Data Range: 0 to 3212.75 V  
Type: Measured  
Supporting Information:  
PGN reference:

Operational Range: same as data range

**(R) SPN 5135      Sensor supply voltage 17**

Sensor ECU supply voltage 17

Data Length: 2 bytes  
Resolution: 0.05 V/bit, 0 offset  
Data Range: 0 to 3212.75 V  
Type: Measured  
Supporting Information:  
PGN reference:

Operational Range: same as data range

**(R) SPN 5136      Sensor supply voltage 18**

Sensor ECU supply voltage 18

Data Length: 2 bytes  
Resolution: 0.05 V/bit, 0 offset  
Data Range: 0 to 3212.75 V  
Type: Measured  
Supporting Information:  
PGN reference:

Operational Range: same as data range

**(R) SPN 5137      *Aftertreatment 1 SCR Catalyst Tank Heater Command***

Command for the Aftertreatment 1 SCR Catalyst Tank Heater. A value of 0% means no heating applied, a value of 100% means full heating applied. See SPN 3363 for the measured value of the Aftertreatment 1 SCR Catalyst Tank Heater.

Data Length:	1 byte	
Resolution:	0.4 %/bit, 0 offset	
Data Range:	0 to 100 %	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64832	

**(R) SPN 5138      *Aftertreatment 2 SCR Catalyst Tank Heater Command***

Command for the Aftertreatment 2 SCR Catalyst Tank Heater. A value of 0% means no heating applied, a value of 100% means full heating applied. See SPN 4431 for the measured value of the Aftertreatment 2 SCR Catalyst Tank Heater.

Data Length:	1 byte	
Resolution:	0.4 %/bit, 0 offset	
Data Range:	0 to 100 %	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	64826	

**(R) SPN 5141      *Low Voltage Disconnect Manual Disconnect State***

State of the Manual Disconnect hardwired input to the LVD. Manual Disconnect is used to override the LVD's normal activity and disconnect all of the LVD outputs. Manual Disconnect is lower in priority than the Manual Connect hardwired input, but has priority over all LVD Set Operating Mode messages.

00 - Input off  
01 - Input on  
10 - Error  
11 - Not installed

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64769	

**(R) SPN 5142      Low Voltage Disconnect Manual Connect State**

State of the Manual Connect hardwired input to the LVD. Manual Connect is used to override the LVD's normal activity and connect all of the LVD outputs. Manual Connect has priority over the Manual Disconnect hardwired input and all LVD Set Operating Mode messages.

00 - Input off  
01 - Input on  
10 - Error  
11 - Not installed

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:        64769

Operational Range: same as data range

**(R) SPN 5143      Low Voltage Disconnect Current Operating Mode**

Current operating mode of the LVD. The current mode is dependent on the state of the Manual Disconnect/Connect hardwired inputs and on the most-recent received LVD Set Desired Operating Mode message. The hardwired inputs have priority over the LVD Set Operating Mode message, and Connects have priority over Disconnects.

0000 - Automatic  
0001-0011 - Reserved  
0100 - Manual Disconnect via J1939 request  
0101 - Manual Connect via J1939 request  
0110-0111 - Reserved  
1000 - Manual Disconnect via hardwired input  
1001 - Manual Connect via hardwired input  
1010-1110 - Reserved  
1111 - Not available

Data Length:            4 bits  
Resolution:            16 states/4 bit, 0 offset  
Data Range:            0 to 15  
Type:                    Measured  
Supporting Information:  
PGN reference:        64769

Operational Range: same as data range



**(R) SPN 5144      Low Voltage Disconnect Output #3 State**

State of the Output #3 from the LVD. Output #3 controls an external load or relay. This external load could be independent of the main output, and may apply to an application specific circuit or zone. If the LVD supports prioritization, this circuit will disconnect before Output #2 and reconnect after Output #2.

0000 - Output off or disconnected  
0001 - Output on or connected  
0010 - Disconnect alarm expired, output off or disconnected  
0011 - Disconnect pending, alarm active  
0100 - Connect pending, alarm active  
0101-1101 - Reserved  
1110 - Output fault  
1111 - Not available or not installed

Data Length:	4 bits	
Resolution:	16 states/4 bit, 0 offset	
Data Range:	0 to 15	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64769	

**(R) SPN 5145      Low Voltage Disconnect Output #2 State**

State of the Output #2 from the LVD. Output #2 controls an external load or relay. This external load could be independent of the main output, and may apply to an application specific circuit or zone. If the LVD supports prioritization, this circuit will disconnect before Output #1 and reconnect after Output #1.

0000 - Output off or disconnected  
0001 - Output on or connected  
0010 - Disconnect alarm expired, output off or disconnected  
0011 - Disconnect pending, alarm active  
0100 - Connect pending, alarm active  
0101-1101 - Reserved  
1110 - Output fault  
1111 - Not available or not installed

Data Length:	4 bits	
Resolution:	16 states/4 bit, 0 offset	
Data Range:	0 to 15	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64769	

**(R) SPN 5146      Low Voltage Disconnect Output #1 State**

State of the Output #1 from the LVD. Output #1 controls an external load or relay. This external load could be independent of the main output, and may apply to an application specific circuit or zone. If the LVD supports prioritization, this circuit will disconnect before the Vout output and reconnect after the Vout output.

0000 - Output off or disconnected  
0001 - Output on or connected  
0010 - Disconnect alarm expired, output off or disconnected  
0011 - Disconnect pending, alarm active  
0100 - Connect pending, alarm active  
0101-1101 - Reserved  
1110 - Output fault  
1111 - Not available or not installed

Data Length:	4 bits	
Resolution:	16 states/4 bit, 0 offset	
Data Range:	0 to 15	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64769	

**(R) SPN 5147      Low Voltage Disconnect Vout Output State**

State of the Vout Output from the LVD. Vout is the LVD's main internal, controllable, high-current output. If the LVD supports prioritization, this circuit will be the last to disconnect and the first to reconnect.

0000 - Output off or disconnected  
0001 - Output on or connected  
0010 - Disconnect alarm expired, output off or disconnected  
0011 - Disconnect pending, alarm active  
0100 - Connect pending, alarm active  
0101-1101 - Reserved  
1110 - Output fault  
1111 - Not available or not installed

Data Length:	4 bits	
Resolution:	16 states/4 bit, 0 offset	
Data Range:	0 to 15	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64769	

**(R) SPN 5148      Low Voltage Disconnect Temperature**

Internal temperature of the LVD.

Data Length:	1 byte	
Resolution:	1 deg C/bit, -40 deg C offset	
Data Range:	-40 to 210 deg C	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64769	

**(R) SPN 5149      *Low Voltage Disconnect Desired Operating Mode***

Desired Operating Mode of the LVD. Used to issue a J1939 request to the LVD to change modes.

0000 - Automatic  
0001-0011 - Reserved  
0100 - Manual Disconnect  
0101 - Manual Connect  
0110-1110 - Reserved  
1111 - No change

Data Length:            4 bits  
Resolution:            16 states/4 bit, 0 offset  
Data Range:            0 to 15  
Type:                    Status  
Supporting Information:  
PGN reference:        38400

Operational Range: same as data range

**(R) SPN 5245      *Aftertreatment 1 DEF Tank Low Level Indicator***

The desired illumination of the driver's warning indicator for diesel exhaust fluid (DEF) tank low level.

000 Off  
001 On – solid  
010 reserved for SAE assignment  
011 reserved for SAE assignment  
100 On – fast blink (1 HZ)  
101 reserved for SAE assignment  
110 reserved for SAE assignment  
111 not available

Data Length:            3 bits  
Resolution:            8 states/3 bit, 0 offset  
Data Range:            0 to 7  
Type:                    Status  
Supporting Information:  
PGN reference:        65110

Operational Range: same as data range

**(R) SPN 5246      *Aftertreatment SCR Operator Inducement Severity***

The severity of operator inducement for anomalies with the SCR system, such as tampering, low DEF quality, and DEF tank level. Higher numerical levels indicate more severe levels of inducement. Level 1 is the least severe.

000 - No Inducement Active  
001 - Inducement Level 1  
010 - Inducement Level 2  
011 - Inducement Level 3  
100 - Inducement Level 4  
101 - Inducement Level 5  
110 - Reserved  
111 - Not Available / Not Supported

Data Length:	3 bits	
Resolution:	8 states/3 bit, 0 offset	
Data Range:	0 to 7	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	65110	

**(R) SPN 5252      *Engine Exhaust Gas Recirculation 2 Differential Pressure***

Differential Pressure across the Exhaust Gas Recirculation 2 (EGR2) system.

Data Length:	2 bytes	
Resolution:	1/128 kPa/bit, -250 kPa offset	
Data Range:	-250 kPa TO 251.99 kPa	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64768	

**(R) SPN 5253      *Engine Exhaust Gas Recirculation 2 Intake Pressure***

EGR2 intake gauge pressure is measured after EGR2 cooler and before EGR2 valve

Data Length:	1 byte	
Resolution:	2 kPa/bit, 0 offset	
Data Range:	0 to 500 kPa	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64768	

**(R) SPN 5254      *Engine Exhaust Gas Recirculation 2 Outlet Absolute Pressure***

Absolute Pressure immediately after the EGR2 valve

Data Length:	2 bytes	
Resolution:	0.1 kPa/bit, 0 offset	
Data Range:	0 to 6,425.5 kPa	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64768	

**(R) SPN 5255      Engine Exhaust Gas Recirculation 2 Temperature**

Temperature of Recirculated Exhaust Gas of EGR2

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 64767

**(R) SPN 5256      Engine Exhaust Gas Recirculation 2 Mixer Intake Temperature**

The temperature of the EGR gas entering the intake of EGR2 system mixer.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 64767

**(R) SPN 5257      Engine Exhaust Gas Recirculation 2 (EGR2) Mass Flow Rate**

Flow rate of gas through the second EGR system. Flow rate of the exhaust gas being recirculated from the 2nd EGR system into combustion air.

Data Length: 2 bytes  
Resolution: 0.05 kg/h per bit, 0 offset  
Data Range: 0 to 3212.75 kg/h      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 61450

**(R) SPN 5258      Engine Exhaust Gas Recirculation 2 (EGR2) Cooler Intake Temperature**

Exhaust Gas Recirculation 2 (EGR2) Temperature measured at EGR2 cooler intake. See SPN 5255 for Engine EGR2 temperature.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 64766

**(R) SPN 5259      Engine Exhaust Gas Recirculation 2 (EGR2) Cooler Intake Gas Absolute Pressure**

Exhaust Gas Recirculation 2 gas absolute pressure is measured at EGR2 cooler intake. See SPN 5253 for EGR2 pressure measured at the EGR2 cooler outlet before the valve.

Data Length:	2 bytes	
Resolution:	0.5 kPa/bit, 0 offset	
Data Range:	0 to 32,127.5 kPa	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64766	

**(R) SPN 5260      Engine Exhaust Gas Recirculation 2 (EGR2) Cooler Efficiency**

Exhaust Gas Recirculation 2 cooler efficiency is an indication of the cooler's ability to reduce the temperature of the exhaust gas that is being recirculated back to the intake. 0% = no reduction in temperature, 100% = maximum cooling. The EGR 2 cooler efficiency is calculated as (EGR 2 cooler intake temperature minus EGR 2 gas temperature) divided by (EGR 2 cooler intake temperature minus engine coolant temperature).

Data Length:	1 byte	
Resolution:	0.4 %/bit, 0 offset	
Data Range:	0 to 100 %	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64766	

**(R) SPN 5261      EGR 2 Cooler Bypass Actuator Position**

EGR2 Cooler Bypass Actuator position, where 0% = Fully Closed (no gas flowing through the bypass), and 100% = Fully Open..

Data Length:	1 byte	
Resolution:	0.4 %/bit, 0 offset	
Data Range:	0 to 100 %	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64766	

**(R) SPN 5262      Engine Exhaust Gas Recirculation 2 Valve Position**

Position of EGR2 valve expressed as a percentage of full travel. 0% means the valve is closed and no exhaust gas is flowing into the air stream. 100% means the valve is fully opened.

Data Length:	2 bytes	
Resolution:	0.0025 %/bit, 0 offset	
Data Range:	0 to 160.6375 %	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64765	

**(R) SPN 5263      Engine Exhaust Gas Recirculation 2 Valve 2 Position**

The position of the second exhaust gas recirculation valve of EGR 2 expressed as a percentage of full travel. 0% means the valve is closed and no exhaust gas is flowing into the air stream. 100% means the valve is fully opened.

Data Length:	2 bytes	
Resolution:	0.0025 %/bit, 0 offset	
Data Range:	0 to 160.6375 %	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64765	

**(R) SPN 5264      Engine Exhaust Gas Recirculation 2 (EGR2) Valve Control**

Desired percentage of maximum Exhaust Gas Recirculation 2 (EGR2) valve opening. 0% means the valve is closed. 100% means maximum opening (full gas flow).

Data Length:	2 bytes	
Resolution:	0.0025 %/bit, 0 offset	
Data Range:	0 to 160.6375 %	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64762	

**(R) SPN 5265      Engine Exhaust Gas Recirculation 2 (EGR2) Valve 2 Control**

Desired percentage of maximum Exhaust Gas Recirculation 2 (EGR2) valve 2 opening. 0% means the valve is closed. 100% means maximum opening (full gas flow).

Data Length:	2 bytes	
Resolution:	0.0025 %/bit, 0 offset	
Data Range:	0 to 160.6375 %	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64762	

**(R) SPN 5266      Diesel Particulate Filter 1 Soot Signal Standard Deviation**

Standard deviation of the soot measurement from diesel particulate filter 1 soot sensor.

Data Length:	2 bytes	
Resolution:	0.0025 %/bit, 0 offset	
Data Range:	0 to 160.6375 %	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64761	

**(R) SPN 5267 Diesel Particulate Filter 1 Soot Signal Maximum**

Maximum output signal level of the current soot measurement from diesel particulate filter 1 soot sensor. This is a statistical value, not the maximum sensing capability of the sensor.

Data Length:	2 bytes	
Resolution:	0.0025 %/bit, 0 offset	
Data Range:	0 to 160.6375 %	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64761	

**(R) SPN 5268 Diesel Particulate Filter 1 Soot Signal Minimum**

Minimum output signal level of the current soot measurement from diesel particulate filter 1 soot sensor. This is a statistical value, not the minimum sensing capability of the sensor.

Data Length:	2 bytes	
Resolution:	0.0025 %/bit, 0 offset	
Data Range:	0 to 160.6375 %	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64761	

**(R) SPN 5269 Diesel Particulate Filter 2 Soot Signal Standard Deviation**

Standard deviation of the soot measurement from diesel particulate filter 2 soot sensor.

Data Length:	2 bytes	
Resolution:	0.0025 %/bit, 0 offset	
Data Range:	0 to 160.6375 %	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64760	

**(R) SPN 5270 Diesel Particulate Filter 2 Soot Signal Maximum**

Maximum output signal level of the current soot measurement from diesel particulate filter 2 soot sensor. This is a statistical value, not the maximum sensing capability of the sensor.

Data Length:	2 bytes	
Resolution:	0.0025 %/bit, 0 offset	
Data Range:	0 to 160.6375 %	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64760	



**(R) SPN 5271 Diesel Particulate Filter 2 Soot Signal Minimum**

Minimum output signal level of the current soot measurement from diesel particulate filter 2 soot sensor. This is a statistical value, not the minimum sensing capability of the sensor.

Data Length:	2 bytes	
Resolution:	0.0025 %/bit, 0 offset	
Data Range:	0 to 160.6375 %	Operational Range: same as data range
Type:	Measured	
Supporting Information:		
PGN reference:	64760	

**(R) SPN 5274 Prohibit Automatic Air Suspension Control**

This parameter is an internal request to the air suspension control system to prohibit automatic air suspension control. If the request is accepted, response intended to be sent in ASC1 (additional status requested in ASC1), there will be no automatic control either for height changes or axle load distribution changes, i.e. hold current pressures in all suspension devices.

For example, to prohibit automatic air suspension control when a wheelchair lift is in use.

00 No request  
01 Request prohibit automatic air suspension control  
10 Error indicator  
11 Not available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Status	
Supporting Information:		
PGN reference:	53760	

**(R) SPN 5275 Parking Brake Actuator Fully Activated**

Signal which indicates when the parking brake actuator is fully activated. (see also SPN 70 and 619).

00 - Parking Brake Actuator not fully activated  
01 - Parking Brake Actuator fully activated  
10 - Error  
11 - Not available

Data Length:	2 bits	
Resolution:	4 states/2 bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
Type:	Measured	
Supporting Information:	See Appendix D - SPN 5275	
PGN reference:	64964	

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**(R) SPN 5276      Engine Exhaust Manifold Bank 1 Flow Balance Valve Actuator Control**

Commanded percentage of maximum Engine Exhaust Manifold Bank 1 Balance valve opening. 0% means valve is closed. 100% means maximum valve opening (full gas flow).

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 2 bytes                |                                       |
| Resolution:             | 0.0025 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 160.6375 %        | Operational Range: same as data range |
| Type:                   | Status                 |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 64764                  |                                       |

**(R) SPN 5277      Engine Exhaust Manifold Bank 1 Flow Balance Valve Actuator Position**

Actual percentage of maximum Engine Exhaust Manifold Bank 1 Balance valve opening. 0% means valve is closed. 100% means maximum valve opening (full gas flow).

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 2 bytes                |                                       |
| Resolution:             | 0.0025 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 160.6375 %        | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 64763                  |                                       |

**(R) SPN 5278      Engine Exhaust Manifold Bank 2 Flow Balance Valve Actuator Control**

Commanded percentage of maximum Engine Exhaust Manifold Bank 2 Balance valve opening. 0% means valve is closed. 100% means maximum valve opening (full gas flow).

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 2 bytes                |                                       |
| Resolution:             | 0.0025 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 160.6375 %        | Operational Range: same as data range |
| Type:                   | Status                 |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 64764                  |                                       |

**(R) SPN 5279      Engine Exhaust Manifold Bank 2 Flow Balance Valve Actuator Position**

Actual percentage of maximum Engine Manifold Bank 2 Balance valve opening. 0% means valve is closed. 100% means maximum valve opening (full gas flow).

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 2 bytes                |                                       |
| Resolution:             | 0.0025 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 160.6375 %        | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 64763                  |                                       |

**(R) SPN 5280      Engine Charge Air Cooler 1 Precooler Intake Temperature**

Temperature of the combustion air measured at the charge air cooler 1 precooler intake.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 64759

**(R) SPN 5281      Engine Charge Air Cooler 1 Precooler Outlet Temperature**

Temperature of the combustion air measured at the charge air cooler 1 precooler outlet.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 64759

**(R) SPN 5282      Engine Charge Air Cooler 1 Precooler Efficiency**

Engine charge air cooler 1 (CAC1) precooler efficiency is an indication of the precooler's ability to reduce the temperature of the combustion air that is being routed through the precooler. 0% = no reduction in temperature, 100% = maximum cooling. The CAC1 precooler efficiency is calculated as (CAC1 precooler Intake temperature minus CAC1 precooler outlet temperature) divided by (CAC1 precooler Intake temperature minus engine coolant temperature). This calculation assumes that the precooler uses engine coolant as the cooling fluid.

Data Length: 1 byte  
Resolution: 0.4 %/bit, 0 offset  
Data Range: 0 to 100 %      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 64759

**(R) SPN 5283      Engine Charge Air Cooler 1 Intake Temperature**

Temperature of the combustion air measured at the CAC 1 Intake.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 64758

**(R) SPN 5284      Engine Charge Air Cooler 1 Ambient Air Temperature**

Temperature of the air surrounding charge air cooler 1.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 64758

**(R) SPN 5285      Engine Charge Air Cooler 1 Efficiency**

Engine charge air cooler 1(CAC1) efficiency is an indication of the CAC's ability to reduce the temperature of the combustion air that is being routed through the CAC1. 0% = no reduction in temperature, 100% = maximum cooling. The CAC1 efficiency is calculated as (CAC1 Intake temperature minus CAC1 outlet temperature) divided by (CAC1 Intake temperature minus CAC1 ambient air temperature). This calculation assumes that the CAC uses a measured or estimated ambient air temperature as the cooling fluid temperature.

Data Length: 1 byte  
Resolution: 0.4 %/bit, 0 offset  
Data Range: 0 to 100 %      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 64758

**(R) SPN 5286      Engine Charge Air Cooler 2 Precooler Intake Temperature**

Temperature of the combustion air measured at the charge air cooler 2 precooler Intake.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 64757

**(R) SPN 5287      Engine Charge Air Cooler 2 Precooler Outlet Temperature**

Temperature of the combustion air measured at the charge air cooler 2 precooler outlet.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 64757

**(R) SPN 5288      Engine Charge Air Cooler 2 Precooler Efficiency**

Engine charge air cooler 2 (CAC2) precooler efficiency is an indication of the precooler's ability to reduce the temperature of the gas that is being routed through the precooler. 0% = no reduction in temperature, 100% = maximum cooling. The CAC2 precooler efficiency is calculated as (CAC2 precooler Intake temperature minus CAC2 precooler outlet temperature) divided by (CAC2 precooler Intake temperature minus engine coolant temperature). This calculation assumes that the CAC2 precooler uses engine coolant as the cooling fluid.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64757               |                                       |

**(R) SPN 5289      Engine Charge Air Cooler 2 Intake Temperature**

Temperature of the combustion air measured at the charge air cooler 2 Intake.

|                         |                                      |                                       |
|-------------------------|--------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                              |                                       |
| Resolution:             | 0.03125 deg C/bit, -273 deg C offset |                                       |
| Data Range:             | -273 to 1734.96875 deg C             | Operational Range: same as data range |
| Type:                   | Measured                             |                                       |
| Supporting Information: |                                      |                                       |
| PGN reference:          | 64756                                |                                       |

**(R) SPN 5290      Engine Charge Air Cooler 2 Outlet Temperature**

Temperature of combustion air after it exits from the Charge Air Cooler 2 but before any mixing of recirculated exhaust gas.

|                         |                                      |                                       |
|-------------------------|--------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                              |                                       |
| Resolution:             | 0.03125 deg C/bit, -273 deg C offset |                                       |
| Data Range:             | -273 to 1734.96875 deg C             | Operational Range: same as data range |
| Type:                   | Measured                             |                                       |
| Supporting Information: |                                      |                                       |
| PGN reference:          | 64756                                |                                       |

**(R) SPN 5291      Engine Charge Air Cooler 2 Ambient Air Temperature**

Temperature of the air surrounding charge air cooler 2.

|                         |                                      |                                       |
|-------------------------|--------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                              |                                       |
| Resolution:             | 0.03125 deg C/bit, -273 deg C offset |                                       |
| Data Range:             | -273 to 1734.96875 deg C             | Operational Range: same as data range |
| Type:                   | Measured                             |                                       |
| Supporting Information: |                                      |                                       |
| PGN reference:          | 64756                                |                                       |

**(R) SPN 5292      Engine Charge Air Cooler 2 Efficiency**

Engine charge air cooler 2 (CAC2) is an indication of the CAC's ability to reduce the temperature of the combustion air that is being routed through the CAC. 0% = no reduction in temperature, 100% = maximum cooling. The CAC2 efficiency is calculated as (CAC2 Intake temperature minus CAC2 outlet temperature) divided by (CAC2 Intake temperature minus CAC2 ambient air temperature). This calculation assumes that the CAC uses a measured or estimated ambient air temperature as the cooling fluid temperature.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64756               |                                       |

**(R) SPN 5293      Allow Level Control During Braking Command**

This parameter overrides the inhibit of level control during braking.

00 = Disallow level control during braking (normal operation)  
01 = Allow level control during braking  
10 = Reserved  
11 = Don't care/take no action

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 53760                    |                                       |

**(R) SPN 5294      Allow Level Control During Braking Status**

This parameter indicates if the function Allow Level Control During Braking is active. Functions is activated by SPN 5293.

00 = Deactivated  
01 = Activated  
10 = Reserved  
11 = Don't care/take no action

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65114                    |                                       |

**(R) SPN 5295      *Speed Dependent Level Control Request***

This parameter activates speed dependent level control in suspension system.

00 = Deactivate  
01 = Activate  
10 = Reserved  
11 = Don't care/take no action

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        53760

Operational Range: same as data range

**(R) SPN 5296      *Speed Dependant Level Control Status***

This parameter indicates if the function Speed Dependant Level Control is active. The function is activated by SPN 5295.

00 = Inactive  
01 = Active  
10 = Reserved  
11 = Don't care/take no action

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        65114

Operational Range: same as data range

**(R) SPN 5312      *Commanded Engine Intake Manifold Pressure***

Provides the commanded set point value for the engine intake manifold pressure.

Data Length:            2 bytes  
Resolution:            0.125 kPa/bit, 0 offset  
Data Range:            0 to +8031.875 kPa (0 to 1164.62 psi)  
Type:                    Measured  
Supporting Information:  
PGN reference:        64916

Operational Range: same as data range

**(R) SPN 5313      *Commanded Engine Fuel Rail Pressure***

Provides the commanded set point value for the engine fuel rail pressure

Data Length:            2 bytes  
Resolution:            1/256 MPa/bit, 0 offset  
Data Range:            0 to 251 MPa  
Type:                    Measured  
Supporting Information:  
PGN reference:        64765

Operational Range: same as data range

**(R) SPN 5314      Commanded Engine Fuel Injection Control Pressure**

Provides the commanded set point value for the engine fuel injection control pressure.

Data Length: 2 bytes  
Resolution: 1/256 MPa/bit, 0 offset  
Data Range: 0 to 251 MPa      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 64765

**(R) SPN 5315      Aftertreatment 2 Warm Up Diesel Oxidation Catalyst Intake Temperature**

Temperature of engine combustion byproducts entering the warm up Diesel Oxidation Catalyst in exhaust bank 2. This diesel parameter should be used with engines fueled by diesel fuel (not gaseous fuel like natural gas or propane). A separate parameter has been defined for gas fueled engines.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 64749

**(R) SPN 5316      Aftertreatment 2 Warm Up Diesel Oxidation Catalyst Outlet Temperature**

Temperature of engine combustion byproducts leaving the warm up Diesel Oxidation Catalyst in exhaust bank 2. This diesel parameter should be used with engines fueled by diesel fuel (not gaseous fuel like natural gas or propane). A separate parameter has been defined for gas fueled engines.

Data Length: 2 bytes  
Resolution: 0.03125 deg C/bit, -273 deg C offset  
Data Range: -273 to 1734.96875 deg C      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference: 64749

**(R) SPN 5324      Engine Glow Plug 1**

Status of the engine glow plug 1.

00 - Inactive  
01 - Active  
10 - Error  
11 - Not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3      Operational Range: same as data range  
Type: Measured  
Supporting Information:  
PGN reference:



**(R) SPN 5325      Engine Glow Plug 2**

Status of the engine glow plug 2.

00 - Inactive  
01 - Active  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:

Operational Range: same as data range

**(R) SPN 5326      Engine Glow Plug 3**

Status of the engine glow plug 3.

00 - Inactive  
01 - Active  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:

Operational Range: same as data range

**(R) SPN 5327      Engine Glow Plug 4**

Status of the engine glow plug 4.

00 - Inactive  
01 - Active  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:

Operational Range: same as data range

**(R) SPN 5328      Engine Glow Plug 5**

Status of the engine glow plug 5.

00 - Inactive  
01 - Active  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:

Operational Range: same as data range

**(R) SPN 5329      Engine Glow Plug 6**

Status of the engine glow plug 6.

00 - Inactive  
01 - Active  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:

Operational Range: same as data range

**(R) SPN 5330      Engine Glow Plug 7**

Status of the engine glow plug 7.

00 - Inactive  
01 - Active  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:

Operational Range: same as data range

**(R) SPN 5331      Engine Glow Plug 8**

Status of the engine glow plug 8.

00 - Inactive  
01 - Active  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:

Operational Range: same as data range

**(R) SPN 5332      Engine Glow Plug 9**

Status of the engine glow plug 9.

00 - Inactive  
01 - Active  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:

Operational Range: same as data range

**(R) SPN 5333      Engine Glow Plug 10**

Status of the engine glow plug 10.

00 - Inactive  
01 - Active  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:

Operational Range: same as data range

**(R) SPN 5334      Engine Glow Plug 11**

Status of the engine glow plug 11.

00 - Inactive  
01 - Active  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:

Operational Range: same as data range

**(R) SPN 5335      Engine Glow Plug 12**

Status of the engine glow plug 12.

00 - Inactive  
01 - Active  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:

Operational Range: same as data range

**(R) SPN 5336      Engine Glow Plug 13**

Status of the engine glow plug 13.

00 - Inactive  
01 - Active  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:

Operational Range: same as data range

**(R) SPN 5337      Engine Glow Plug 14**

Status of the engine glow plug 14.

00 - Inactive  
01 - Active  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:

Operational Range: same as data range

**(R) SPN 5338      Engine Glow Plug 15**

Status of the engine glow plug 15.

00 - Inactive  
01 - Active  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:

Operational Range: same as data range

**(R) SPN 5339      Engine Glow Plug 16**

Status of the engine glow plug 16.

00 - Inactive  
01 - Active  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:

Operational Range: same as data range

**(R) SPN 5340      Engine Glow Plug 17**

Status of the engine glow plug 17.

00 - Inactive  
01 - Active  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:

Operational Range: same as data range

**(R) SPN 5341      Engine Glow Plug 18**

Status of the engine glow plug 18.

00 - Inactive  
01 - Active  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:

Operational Range: same as data range

**(R) SPN 5342      Engine Glow Plug 19**

Status of the engine glow plug 19.

00 - Inactive  
01 - Active  
10 - Error  
11 - Not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Measured  
Supporting Information:  
PGN reference:

Operational Range: same as data range

**(R) SPN 5343      Engine Glow Plug 20**

Status of the engine glow plug 20.

- 00 - Inactive
- 01 - Active
- 10 - Error
- 11 - Not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Measured  
Supporting Information:  
PGN reference:

Operational Range: same as data range

**(R) SPN 5344      Transmission Warning Indicator**

Signal from transmission indicating that some aspect of its operation is not functioning correctly, and as a result, transmission operation may be altered or restricted. The indicator is typically a lamp. Distinctions in meaning between the continuous and flashing are left to the transmission manufacturer.

- 00 - Transmission Warning Indicator is off
- 01 - Transmission Warning Indicator is on continuously
- 10 - Transmission Warning Indicator is flashing
- 11 - Not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 65098

Operational Range: same as data range

**(R) SPN 5345      Transmission Overheat Indicator**

Signal from transmission indicating that its fluid temperature is above normal acceptable limits, and as a result, transmission operation may be altered or restricted. The indicator is typically a lamp. Distinctions in meaning between the continuous and flashing are left to the transmission manufacturer..

- 00 - Transmission Overheat Indicator is off
- 01 - Transmission Overheat Indicator is on continuously
- 10 - Transmission Overheat Indicator is flashing
- 11 - Not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 64917

Operational Range: same as data range

**(R) SPN 5346      Driveline Retarder Overheat Indicator**

Signal from the driveline retarder indicating that its fluid temperature is above normal acceptable limits, and as a result, retarder operation may be altered or restricted. The indicator is typically a lamp. Distinctions in meaning between the continuous and flashing are left to the transmission manufacturer.

00 - Driveline Retarder Overheat Indicator is off  
01 - Driveline Retarder Overheat Indicator is on continuously  
10 - Driveline Retarder Overheat Indicator is flashing  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65275                    |                                       |

**(R) SPN 5347      Lateral Acceleration Extended Range**

Indicates lateral acceleration of the vehicle. A positive lateral acceleration signal results when the vehicle is accelerated to the left. See SPN 1809 for alternate range.

|                         |                                                             |                                       |
|-------------------------|-------------------------------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                                                     |                                       |
| Resolution:             | 0.01 m/s <sup>2</sup> per bit, -320 m/s <sup>2</sup> offset |                                       |
| Data Range:             | -320 to +322.55 m/s <sup>2</sup>                            | Operational Range: same as data range |
| Type:                   | Measured                                                    |                                       |
| Supporting Information: |                                                             |                                       |
| PGN reference:          | 61485                                                       |                                       |

**(R) SPN 5348      Longitudinal Acceleration Extended Range**

Indicates longitudinal acceleration of the vehicle. A positive longitudinal acceleration signal results when the vehicle speed increases in the forward direction. See SPN 1810 for alternate range.

|                         |                                                             |                                       |
|-------------------------|-------------------------------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                                                     |                                       |
| Resolution:             | 0.01 m/s <sup>2</sup> per bit, -320 m/s <sup>2</sup> offset |                                       |
| Data Range:             | -320 to +322.55 m/s <sup>2</sup>                            | Operational Range: same as data range |
| Type:                   | Measured                                                    |                                       |
| Supporting Information: |                                                             |                                       |
| PGN reference:          | 61485                                                       |                                       |

**(R) SPN 5349      Vertical Acceleration Extended Range**

Indicates vertical acceleration of the vehicle and the effect of gravity. A positive vertical acceleration signal results when the vehicle is stationary on a horizontal surface.

|                         |                                                             |                                       |
|-------------------------|-------------------------------------------------------------|---------------------------------------|
| Data Length:            | 2 bytes                                                     |                                       |
| Resolution:             | 0.01 m/s <sup>2</sup> per bit, -320 m/s <sup>2</sup> offset |                                       |
| Data Range:             | -320 to +322.55 m/s <sup>2</sup>                            | Operational Range: same as data range |
| Type:                   | Measured                                                    |                                       |
| Supporting Information: |                                                             |                                       |
| PGN reference:          | 61485                                                       |                                       |



**(R) SPN 5350      Lateral Acceleration Extended Range Figure of Merit**

Figure of merit for lateral acceleration measurement.

00 = lateral acceleration is fully functional. Data is within sensor specification  
01 = lateral acceleration is degraded. Data is suspect due to environmental conditions  
10 = error  
11 = not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61485                    |                                       |

**(R) SPN 5351      Longitudinal Acceleration Extended Range Figure of Merit**

Figure of merit for longitudinal acceleration measurement.

00 = longitudinal acceleration is fully functional. Data is within sensor specification  
01 = longitudinal acceleration is degraded. Data is suspect due to environmental conditions  
10 = error  
11 = not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61485                    |                                       |

**(R) SPN 5352      Vertical Acceleration Extended Range Figure of Merit**

Figure of merit for vertical acceleration measurement.

00 = vertical acceleration is fully functional. Data is within sensor specification  
01 = vertical acceleration is degraded. Data is suspect due to environmental conditions  
10 = error  
11 = not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 61485                    |                                       |

**(R) SPN 5353      Support Variable Transmission Repetition Rate for Acceleration Sensor**

Indicates which acceleration transmission rate is supported by the ECU in addition to the required 10 ms transmission rate.

| Bit Position                      | Transmission Rate                                        |
|-----------------------------------|----------------------------------------------------------|
| 1 (bit position 7.7 of PGN 61485) | 0 = 20 ms rate supported<br>1 = 20 ms rate not supported |
| 2 (bit position 7.8 of PGN 61485) | Reserved for SAE assignment (set to one)                 |

Note: Both bits set to 1 indicate that the ECU only supports standard transmission rate of 10 ms.

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 2 bits               |                                       |
| Resolution:             | bit-mapped, 0 offset |                                       |
| Data Range:             | 0 to 3               | Operational Range: same as data range |
| Type:                   | Status               |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 61485                |                                       |

**(R) SPN 5366      Engine Desired Turbocharger Compressor Bypass Actuator 1 Position**

The requested position of the Engine Turbocharger Compressor Bypass actuator by the engine ECM, where 0% represents bypass fully closed and 100% represents bypass fully open.

This is the position that the device is attempting to achieve.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64931               |                                       |

**(R) SPN 5367      Engine Turbocharger Compressor Bypass Actuator 1 Preliminary FMI**

Used to identify the applicable J1939-73 FMI detected in the Engine Turbocharger Compressor Bypass Actuator 1 by the manufacturers software. When there is no failure FMI 31 is transmitted. When there is multiple failures, the most severe is transmitted.

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 64931            |                                       |

**(R) SPN 5368      Engine Turbocharger Compressor Bypass Actuator 1 Temperature Status**

Used to identify the status of the Engine Turbocharger Compressor Bypass Actuator 1 drive circuitry temperature. Temperature excursions may affect the torque output.

000 – High Most severe  
001 – High Least severe  
010 – In Range  
011 – Low Least severe  
100 – Low Most severe  
101 – Not Defined  
110 – Error  
111 – Not available

Data Length:            3 bits  
Resolution:            8 states/3 bit, 0 offset  
Data Range:            0 to 7  
Type:                    Status  
Supporting Information:  
PGN reference:        64931

Operational Range: same as data range

**(R) SPN 5369      Engine Turbocharger Compressor Bypass Actuator 2 command**

The command to a compressor bypass actuator 2, normalized to percent, where 0% nominally represents fully closed and 100% represents fully open. Typically, the turbocharger compressor bypass actuator is used to keep the engine out of surge by metering compressed air (charge).

Data Length:            2 bytes  
Resolution:            0.0025 %/bit, 0 offset  
Data Range:            0 to 160.6375 %  
Type:                    Status  
Supporting Information:  
PGN reference:        64931

Operational Range: same as data range

**(R) SPN 5370      Engine Desired Turbocharger Wastegate Actuator 1 Position**

The Requested Valve position of the Turbocharger Wastegate Valve 1, commanded by the engine ECM. A value of 0% represents fully closed and a value of 100% represents fully open.

This is the position that the device is attempting to achieve.

Data Length:            1 byte  
Resolution:            0.4 %/bit, 0 offset  
Data Range:            0 to 100 %  
Type:                    Status  
Supporting Information:  
PGN reference:        65174

Operational Range: same as data range

**(R) SPN 5371      Engine Turbocharger Wastegate Actuator 1 Preliminary FMI**

Used to identify the applicable J1939-73 FMI detected in the Engine Turbocharger Wastegate Actuator 1 by the manufacturers software. When there is no failure FMI 31 is transmitted. When there is multiple failures, the most severe is transmitted

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 65174            |                                       |

**(R) SPN 5372      Engine Turbocharger Wastegate Actuator 1 Temperature Status**

Used to identify the status of the Engine Turbocharger Wastegate Actuator 1 drive circuitry temperature. Temperature excursions may affect the torque output.

000 – High Most severe  
001 – High Least severe  
010 – In Range  
011 – Low Least severe  
100 – Low Most severe  
101 – Not Defined  
110 – Error  
111 – Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 3 bits                   |                                       |
| Resolution:             | 8 states/3 bit, 0 offset |                                       |
| Data Range:             | 0 to 7                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 65174                    |                                       |

**(R) SPN 5373      Engine Desired Turbocharger Wastegate Actuator 2 Position**

The Requested Valve position of the Turbocharger Wastegate Valve 2, commanded by the engine ECM. A value of 0% represents fully closed and a value of 100% represents fully open.

This is the position that the device is attempting to achieve.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Status              |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 65174               |                                       |

**(R) SPN 5374      Engine Desired Throttle Valve 1 Position**

The desired position of the Throttle valve 1 that is regulating the fluid, usually air/fuel mixture to the engine as commanded by the Engine Control unit. 0% represents no supply and 100% is full supply.

This is the position that the device is attempting to achieve.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Status              |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64754               |                                       |

**(R) SPN 5375      Engine Throttle Valve 1 Preliminary FMI**

Used to identify the applicable J1939-73 FMI detected in the Engine Throttle Valve 1 by the manufacturers software. When there is no failure FMI 31 is transmitted. When there is multiple failures, the most severe is transmitted.

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 64754            |                                       |

**(R) SPN 5376      Engine Throttle Valve 1 Temperature Status**

Used to identify the status of the Engine Throttle Valve 1 drive circuitry temperature. Temperature excursions may affect the torque output.

000 – High most severe  
001 – High Least severe  
010 – In Range  
011 – Low Least severe  
100 – Low Most severe  
101 – Not Defined  
110 – Error  
111 – Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 3 bits                   |                                       |
| Resolution:             | 8 states/3 bit, 0 offset |                                       |
| Data Range:             | 0 to 7                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64754                    |                                       |

**(R) SPN 5377      Engine Desired Throttle Valve 2 Position**

The desired position of the Throttle valve 2 that is regulating the fluid, usually air/fuel mixture to the engine as commanded by the Engine Control unit. 0% represents no supply and 100% is full supply.

This is the position that the device is attempting to achieve.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Status              |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64754               |                                       |

**(R) SPN 5378      Engine Throttle Valve 2 Preliminary FMI**

Used to identify the applicable J1939-73 FMI detected in the Engine Throttle Valve 2 by the manufacturers software. When there is no failure FMI 31 is transmitted. When there is multiple failures, the most severe is transmitted.

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 64754            |                                       |

**(R) SPN 5379      Engine Throttle Valve 2 Temperature status**

Used to identify the status of the Engine Throttle Valve 2 drive circuitry temperature. Temperature excursions may affect the torque output.

000 – High Most severe  
001 – High Least severe  
010 – In Range  
011 – Low Least severe  
100 – Low Most severe  
101 – Not Defined  
110 – Error  
111 – Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 3 bits                   |                                       |
| Resolution:             | 8 states/3 bit, 0 offset |                                       |
| Data Range:             | 0 to 7                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64754                    |                                       |

**(R) SPN 5380      Engine Fuel Valve 1 Preliminary FMI**

Used to identify the applicable J1939-73 FMI detected in the Engine Fuel Valve 1 by the manufacturers software. When there is no failure FMI 31 is transmitted. When there is multiple failures, the most severe is transmitted.

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 64754            |                                       |

**(R) SPN 5381      Engine Fuel Valve 1 Temperature Status**

Used to identify the status of the Engine Fuel valve 1 drive circuitry temperature. Temperature excursions may affect the torque output.

000 – High Most severe  
001 – High Least severe  
010 – In Range  
011 – Low Least severe  
100 – Low Most severe  
101 – Not Defined  
110 – Error  
111 – Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 3 bits                   |                                       |
| Resolution:             | 8 states/3 bit, 0 offset |                                       |
| Data Range:             | 0 to 7                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64754                    |                                       |

**(R) SPN 5382      Engine Fuel Valve 2 Preliminary FMI**

Used to identify the applicable J1939-73 FMI detected in the Engine Fuel Valve 2 by the manufacturers software. When there is no failure FMI 31 is transmitted. When there is multiple failures, the most severe is transmitted.

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 64754            |                                       |

**(R) SPN 5383      Engine Fuel Valve 2 Temperature Status**

Used to identify the status of the Engine Fuel valve 2 drive circuitry temperature. Temperature excursions may affect the torque output.

000 – High most severe  
001 – High Least severe  
010 – In Range  
011 – Low Least severe  
100 – Low Most severe  
101 – Not Defined  
110 – Error  
111 – Not available

Data Length:            3 bits  
Resolution:            8 states/3 bit, 0 offset  
Data Range:            0 to 7  
Type:                    Status  
Supporting Information:  
PGN reference:        64754

Operational Range: same as data range

**(R) SPN 5384      Engine Turbocharger Wastegate Actuator 2 Preliminary FMI**

Used to identify the applicable J1939-73 FMI detected in the Engine Turbocharger Wastegate Actuator 2 by the manufacturers software. When there is no failure FMI 31 is transmitted. When there is multiple failures, the most severe is transmitted

Data Length:            5 bits  
Resolution:            Binary, 0 offset  
Data Range:            0 to 31  
Type:                    Status  
Supporting Information:  
PGN reference:        64753

Operational Range: same as data range

**(R) SPN 5385      Engine Turbocharger Wastegate Actuator 2 Temperature Status**

Used to identify the status of the Engine Turbocharger Wastegate Actuator 2 drive circuitry temperature. Temperature excursions may affect the torque output.

000 – High most severe  
001 – High Least severe  
010 – In Range  
011 – Low Least severe  
100 – Low Most severe  
101 – Not Defined  
110 – Error  
111 – Not available

Data Length:            3 bits  
Resolution:            8 states/3 bit, 0 offset  
Data Range:            0 to 7  
Type:                    Status  
Supporting Information:  
PGN reference:        64753

Operational Range: same as data range



**(R) SPN 5386      Engine Turbocharger Wastegate Actuator 1 Command**

The command to a Turbocharger Wastegate actuator 1, normalized to percent, where 0% nominally represents fully closed (No Flow) and 100% represents fully open (Max Flow).

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 2 bytes                |                                       |
| Resolution:             | 0.0025 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 160.6375 %        | Operational Range: same as data range |
| Type:                   | Status                 |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 61486                  |                                       |

**(R) SPN 5387      Engine Turbocharger Wastegate Actuator 2 Command**

The command to a Turbocharger Wastegate actuator 2, normalized to percent, where 0% nominally represents fully closed (No Flow) and 100% represents fully open (Max Flow).

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 2 bytes                |                                       |
| Resolution:             | 0.0025 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 160.6375 %        | Operational Range: same as data range |
| Type:                   | Status                 |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 61486                  |                                       |

**(R) SPN 5388      Engine Turbocharger Compressor Bypass Actuator 2 Position**

Measures the position of the turbocharger compressor bypass actuator 2, where 0% represents bypass fully closed and 100% represents bypass fully open. Typically, the compressor bypass is used to lower the compressor outlet pressure and/or intake manifold pressure during situations where too much boost is being generated by the turbocharger. Typically, a compressor bypass will be plumbed from the compressor outlet or intake manifold back to the compressor inlet, with the compressor bypass actuator and valve in place to regulate bypass flow.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64755               |                                       |

**(R) SPN 5389      Engine Desired Turbocharger Compressor Bypass Actuator 2 Position**

The desired position of the Engine Turbocharger Compressor Bypass actuator 2 by the engine ECM, where 0% represents bypass fully closed and 100% represents bypass fully open.

This is the position that the device is attempting to achieve.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Status              |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64755               |                                       |

**(R) SPN 5390      Engine Turbocharger compressor Bypass Actuator 2 Preliminary FMI**

Used to identify the applicable J1939-73 FMI detected in the Engine Turbocharger Compressor Bypass Actuator 1 by the manufacturers software. When there is no failure FMI 31 is transmitted. When there is multiple failures, the most severe is transmitted.

|                         |                  |                                       |
|-------------------------|------------------|---------------------------------------|
| Data Length:            | 5 bits           |                                       |
| Resolution:             | Binary, 0 offset |                                       |
| Data Range:             | 0 to 31          | Operational Range: same as data range |
| Type:                   | Status           |                                       |
| Supporting Information: |                  |                                       |
| PGN reference:          | 64755            |                                       |

**(R) SPN 5391      Engine Turbocharger Compressor Bypass Actuator 2 Temperature Status**

Used to identify the status of the Engine Turbocharger Compressor Bypass Actuator 2 drive circuitry temperature. Temperature excursions may affect the torque output.

000 – High most severe  
001 – High Least severe  
010 – In Range  
011 – Low Least severe  
100 – Low Most severe  
101 – Not Defined  
110 – Error  
111 – Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 3 bits                   |                                       |
| Resolution:             | 8 states/3 bit, 0 offset |                                       |
| Data Range:             | 0 to 7                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64755                    |                                       |

**(R) SPN 5398      Estimated Pumping - Percent Torque**

The calculated torque that indicates the estimated amount of torque loss due to the engine air handling system. The value transmitted in this parameter is included in SPN 514 (Nominal Friction - Percent Torque). The data is transmitted as a percent of reference engine torque (see the engine configuration message, PGN 65251).

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 1 byte                 |                                       |
| Resolution:             | 1 %/bit, -125 % offset |                                       |
| Data Range:             | -125 to 125 %          | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 61443                  |                                       |

**(R) SPN 5399      DPF Thermal Management Active**

Indicates that the exhaust temperatures have been elevated for regeneration of the diesel particulate filter aftertreatment system or in preparation of regeneration of the diesel particulate aftertreatment system.

00 - DPF Thermal Management is not active

01 - DPF Thermal Management is active

10 - Reserved

11 - Don't care

Data Length: 2 bits

Resolution: 4 states/2 bit, 0 offset

Data Range: 0 to 3

Type: Status

Supporting Information:

PGN reference: 61443

Operational Range: same as data range

**(R) SPN 5400      SCR Thermal Management Active**

Indicates that the exhaust temperatures have been elevated for regeneration of the SCR aftertreatment system or in preparation of regeneration of the SCR aftertreatment system.

00 - SCR Thermal Management is not active

01 - SCR Thermal Management is active

10 - Reserved

11 - Don't care

Data Length: 2 bits

Resolution: 4 states/2 bit, 0 offset

Data Range: 0 to 3

Type: Status

Supporting Information:

PGN reference: 61443

Operational Range: same as data range

**(R) SPN 5402      Lift Relay Control**

Command signal used to Engage and Disengage the Lift Relay controlling a Steady-State Magnet.

00 = Off, Disable Lift Relay Request

01 = On, Enable Lift Relay Request

10 = Reserved

11 = Take No Action

Data Length: 2 bits

Resolution: 4 states/2 bit, 0 offset

Data Range: 0 to 3

Type: Status

Supporting Information:

PGN reference: 61484

Operational Range: same as data range

**(R) SPN 5403      Drop Relay Control**

Command signal used to Engage and Disengage the Drop Relay controlling a Steady-State Magnet.

00 = Off, Disable Drop Relay Request

01 = On, Enable Drop Relay Request

10 = Reserved

11 = Take No Action

Data Length: 2 bits

Resolution: 4 states/2 bit, 0 offset

Data Range: 0 to 3

Operational Range: same as data range

Type: Status

Supporting Information:

PGN reference: 61484

**(R) SPN 5404      PTO Shutdown has Shutdown Engine**

Status signal which identifies whether or not the engine has been shutdown by the PTO shutdown system.

00 - No

01 - Yes

10 - Error

11 - Not available

Data Length: 2 bits

Resolution: 4 states/2 bit, 0 offset

Data Range: 0 to 3

Operational Range: same as data range

Type: Status

Supporting Information:

PGN reference: 65252

**(R) SPN 5405      Set Elevation Sensor #1 Reference Elevation**

Command from a display or other external device (i.e. remote switch) to the land leveling system controller instructing the controller to set the reference elvation based on data received from the corresponding land leveling sensor.

00 = Do not Set Reference Elevation

01 = Set Reference Elevation

10 = Reserved

11 = Don't Care / Take No Action

Data Length: 2 bits

Resolution: 4 states/2 bit, 0 offset

Data Range: 0 to 3

Operational Range: same as data range

Type: Status

Supporting Information:

PGN reference: 61453

**(R) SPN 5406      Set Elevation Sensor #2 Reference Elevation**

Command from a display or other external device (i.e. remote switch) to the land leveling system controller instructing the controller to set the reference elvation based on data received from the corresponding land leveling sensor.

00 = Do not Set Reference Elevation  
01 = Set Reference Elevation  
10 = Reserved  
11 = Don't Care / Take No Action

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        61453

Operational Range: same as data range

**(R) SPN 5407      Blade Control Mode - Left**

Indicate if the land leveling system's automatic control is active or inactive for the elevation sensor on the left side of the blade. The "left" notation is applicable to grading machines such tractors and motor graders where "left" is the position of the elevation sensor as seen by the operator.

If the left sensor is not installed, then the value communicated should be "1111". For systems with a single elevation sensor, the system should be flexible enough to be configured in a manner which most accurately represents what is installed on the machine.

Manual: Operator controls the position of the blade as normal

Auto: The grade control system is controlling the position of the blade without operator input

Inactive Auto: An operating condition exists which prevents the grade control system from allowing automatic controls to engage. This would include conditions such as laser signal is not detected, but not faulty components.

Error: A fault exists in the system.

0000 = Manual  
0001 = Auto  
0010 = Inactive Auto  
0011-1101 = Reserved  
1110 = Error  
1111 = Not Available

Data Length:            4 bits  
Resolution:            16 states/4 bit, 0 offset  
Data Range:            0 to 15  
Type:                    Status  
Supporting Information:  
PGN reference:        65138

Operational Range: same as data range

**(R) SPN 5408      Blade Control Mode - Right**

Indicate if the land leveling system's automatic control is active or inactive for the elevation sensor on the right side of the blade. The "left" notation is applicable to grading machines such tractors and motor graders where "right" is the position of the elevation sensor as seen by the operator.

If the right sensor is not installed, then the value communicated should be "1111". For systems with a single elevation sensor, the system should be flexible enough to be configured in a manner which most accurately represents what is installed on the machine.

Manual: Operator controls the position of the blade as normal

Auto: The grade control system is controlling the position of the blade without operator input

Inactive Auto: An operating condition exists which prevents the grade control system from allowing automatic controls to engage. This would include conditions such as laser signal is not detected, but not faulty components.

Error: A fault exists in the system.

0000 = Manual

0001 = Auto

0010 = Inactive Auto

0011-1101 = Reserved

1110 = Error

1111 = Not Available

Data Length: 4 bits

Resolution: 16 states/4 bit, 0 offset

Data Range: 0 to 15

Type: Status

Supporting Information:

PGN reference: 65138

Operational Range: same as data range

**(R) SPN 5409      Land Leveling System Enable Status**

Communicate the enable/disable status of the Land Leveling System.

00 = Disabled

01 = Enabled

10 = Error

11 = Not available / Not installed

Data Length: 2 bits

Resolution: 4 states/2 bit, 0 offset

Data Range: 0 to 3

Type: Status

Supporting Information:

PGN reference: 65138

Operational Range: same as data range

**(R) SPN 5410      Blade Elevation Deviation - Left**

Indicate the blade's left elevation deviation with respect to the reference elevation. Serves as an indication of how far the left end of the blade is above or below grade. A positive number indicates that the blade is above the desired grade. A negative value indicates the blade is below the desired grade.

Data Length: 2 bytes  
Resolution: 1 mm/bit, -32000 mm offset  
Data Range: -32000 to 32255 mm (-32.000 to 32.255 m) Operational Range: same as data range  
Type: Status  
Supporting Information:  
PGN reference: 64750

**(R) SPN 5411      Blade Elevation Deviation - Right**

Indicate the blade's right elevation deviation with respect to the reference elevation. Serves as an indication of how far the right end of the blade is above or below grade. A positive number indicates that the blade is above the desired grade. A negative value indicates the blade is below the desired grade.

Data Length: 2 bytes  
Resolution: 1 mm/bit, -32000 mm offset  
Data Range: -32000 to 32255 mm (-32.000 to 32.255 m) Operational Range: same as data range  
Type: Status  
Supporting Information:  
PGN reference: 64750

**(R) SPN 5412      Blade Reference Elevation Offset - Left**

Indicates the blade's left elevation offset with respect to the reference elevation. An offset of 0 m represents no offset from the reference elevation. A positive number indicates that the offset elevation is above the original reference elevation. A negative value indicates the offset elevation is below the original reference elevation.

Data Length: 2 bytes  
Resolution: 1 mm/bit, -32000 mm offset  
Data Range: -32000 to 32255 mm (-32.000 to 32.255 m) Operational Range: same as data range  
Type: Status  
Supporting Information:  
PGN reference: 64750

**(R) SPN 5413      Blade Reference Elevation Offset - Right**

Indicates the blade's right elevation offset with respect to the reference elevation. An offset of 0 m represents no offset from the reference elevation. A positive number indicates that the offset elevation is above the original reference elevation. A negative value indicates the offset elevation is below the original reference elevation.

Data Length: 2 bytes  
Resolution: 1 mm/bit, -32000 mm offset  
Data Range: -32000 to 32255 mm (-32.000 to 32.255 m) Operational Range: same as data range  
Type: Status  
Supporting Information:  
PGN reference: 64750

**(R) SPN 5414      *Aftertreatment 1 SCR Catalyst Tank 2 Heater Command***

This is the command for the Aftertreatment 1 SCR Catalyst Tank 2 Heater. See SPN 4372 for the measured value of the Aftertreatment 1 SCR Catalyst Tank 2 Heater.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Status              |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64832               |                                       |

**(R) SPN 5415      *Aftertreatment 2 SCR Catalyst Tank 2 Heater Command***

This is the command for the Aftertreatment 2 SCR Catalyst Tank 2 Heater. See SPN 4438 for the measured value of the Aftertreatment 2 SCR Catalyst Tank 2 Heater.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Status              |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64826               |                                       |

**(R) SPN 5416      *Engine Wait To Start Lamp Data***

This parameter provides measured data from the Engine Wait To Start Lamp. See SPN 1081 for the command.

00 - Lamp deactivated (off)  
01 - Lamp activated (on)  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64773                    |                                       |

**(R) SPN 5417      *Engine Fuel Filter (Suction Side) Intake Absolute Pressure***

Absolute pressure of fuel at the intake of the fuel filter (suction side) located between the fuel tank and the fuel supply pump. See Figures SPN16\_A & SPN16\_B.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 2 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 500 kPa        | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64752               |                                       |



**(R) SPN 5422      Engine Intake Manifold 2 Absolute Pressure**

The absolute pressure measurement of the air intake manifold for bank 2 or the second air intake manifold. If there are multiple air pressure sensors in the intake stream, this is the last one in flow direction before entering the combustion chamber.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 2 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 500 kPa        | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64976               |                                       |

**(R) SPN 5423      Aftertreatment 1 Fuel Pump Relay Control**

Indicates how the device is controlling the aftertreatment 1 fuel pump relay.

00 off  
01 on  
10 reserved for SAE assignment  
11 not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64869                    |                                       |

**(R) SPN 5424      Aftertreatment 1 Fuel Flow Diverter Valve Control**

Indicates how the device is controlling the aftertreatment 1 fuel flow diverter valve. When this valve is on it diverts fuel flow from the Aftertreatment 1 Regeneration Device.

00 off  
01 on  
10 reserved for SAE assignment  
11 not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64869                    |                                       |

**(R) SPN 5425      *Aftertreatment 1 Fuel Pressure 2 Actuator Control***

Indicates how the device is controlling the aftertreatment 1 fuel pressure 2 regulating control valve. 0% = fully closed, 100%=fully open.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 2 bytes                |                                       |
| Resolution:             | 0.0025 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 160.6375 %        | Operational Range: same as data range |
| Type:                   | Status                 |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 64869                  |                                       |

**(R) SPN 5426      *Aftertreatment 2 Fuel Pump Relay Control***

Indicates how the device is controlling the aftertreatment 2 fuel pump relay.

00 off  
01 on  
10 reserved for SAE assignment  
11 not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64836                    |                                       |

**(R) SPN 5427      *Aftertreatment 2 Fuel Flow Diverter Valve Control***

Indicates how the device is controlling the aftertreatment 2 fuel flow diverter valve. When this valve is on it diverts fuel flow from the Aftertreatment 2 Regeneration Device.

00 off  
01 on  
10 reserved for SAE assignment  
11 not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64836                    |                                       |

**(R) SPN 5428      *Aftertreatment 2 Fuel Pressure 2 Control***

Indicates how the device is controlling the aftertreatment 2 fuel pressure 2 regulating control valve. 0% = fully closed, 100%=fully open.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 2 bytes                |                                       |
| Resolution:             | 0.0025 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 160.6375 %        | Operational Range: same as data range |
| Type:                   | Status                 |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 64836                  |                                       |

**(R) SPN 5429      *Engine Exhaust Gas Recirculation 2 Intake Absolute Pressure***

EGR intake absolute pressure measured before the EGR 2 valve.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64768                 |                                       |

**(R) SPN 5430      *Engine Exhaust Gas Recirculation 1 Intake Absolute Pressure***

EGR intake absolute pressure measured before the EGR 1 valve.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64751                 |                                       |

**(R) SPN 5431      *Engine Exhaust Gas Recirculation 1 Outlet Absolute Pressure (High Resolution)***

EGR outlet absolute pressure is measured after the EGR 1 valve. See SPN 5019 for 1 byte resolution.

|                         |                       |                                       |
|-------------------------|-----------------------|---------------------------------------|
| Data Length:            | 2 bytes               |                                       |
| Resolution:             | 0.1 kPa/bit, 0 offset |                                       |
| Data Range:             | 0 to 6,425.5 kPa      | Operational Range: same as data range |
| Type:                   | Measured              |                                       |
| Supporting Information: |                       |                                       |
| PGN reference:          | 64751                 |                                       |

**(R) SPN 5432      *Memory level***

Signal which indicates that the air suspension control has memory levels selected or stored.

Response to memory level request in ASC2 (byte 8.5). If the request was executed the respective status will be set. If the request was not executed "requested level not available" will be set in Suspension control refusal information (ASC1 byte 8.1).

0000: No memory level  
0001: Memory level 1 selected  
0010: Memory level 2 selected  
0011: Memory level 3 selected  
0100: Memory level 4 selected  
0101: Memory level 5 selected  
0110: reserved  
0111: reserved  
1000: reserved  
1001: Memory level 1 stored  
1010: Memory level 2 stored  
1011: Memory level 3 stored  
1100: Memory level 4 stored  
1101: Memory level 5 stored  
1110: Error indicator  
1111: not available

Data Length:            4 bits  
Resolution:            16 states/4 bit, 0 offset  
Data Range:            0 to 15  
Type:                    Status  
Supporting Information:  
PGN reference:        65114

Operational Range: same as data range

**(R) SPN 5433      Memory level request**

Signal which indicates that the air suspension control requests a memory level or a memory level shall be stored.

The storage of the current memory level is requested by "Store memory level x". The acknowledge is set in "memory level x stored" (ASC1 byte 8.5). A memory level demand is requested by "Memory level x request". The acknowledge is set in "memory level x selected" (ASC1 byte 8.5)

0000: No memory level request

0001: Memory level 1 request

0010: Memory level 2 request

0011: Memory level 3 request

0100: Memory level 4 request

0101: Memory level 5 request

0110: reserved

0111: reserved

1000: reserved

1001: Store Memory level 1

1010: Store Memory level 2

1011: Store Memory level 3

1100: Store Memory level 4

1101: Store Memory level 5

1110: Reserved

1111: Don't care

Data Length: 4 bits

Resolution: 16 states/4 bit, 0 offset

Data Range: 0 to 15

Type: Status

Supporting Information:

PGN reference: 53760

Operational Range: same as data range

**(R) SPN 5434      Aftertreatment 1 SCR Catalyst Reagent Tank Fill Valve Command**

Commanded percentage of maximum Aftertreatment 1 SCR Catalyst Reagent Tank Fill Valve opening. 100% means the fill valve is fully open providing maximum flow of reagent into the reagent tank.

Data Length: 1 byte

Resolution: 0.4 %/bit, 0 offset

Data Range: 0 to 100 %

Type: Status

Supporting Information:

PGN reference: 64828

Operational Range: same as data range

**(R) SPN 5435      *Aftertreatment 1 SCR Catalyst Reagent Pump State***

State of aftertreatment 1 SCR Catalyst Reagent dosing pump.

00 pump operational  
01 pump error  
10 reserved for SAE assignment  
11 not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 64828

Operational Range: same as data range

**(R) SPN 5436      *Aftertreatment 1 SCR Catalyst Reagent Tank Drain Valve Command***

Commanded percentage of maximum Aftertreatment 1 SCR Catalyst Reagent Tank Drain Valve opening. 100% means the drain valve is fully open providing maximum flow of reagent out of the reagent tank.

Data Length: 1 byte  
Resolution: 0.4 %/bit, 0 offset  
Data Range: 0 to 100 %  
Type: Status  
Supporting Information:  
PGN reference: 64828

Operational Range: same as data range

**(R) SPN 5437      *Aftertreatment 2 SCR Catalyst Reagent Tank Fill Valve Command***

Commanded percentage of maximum Aftertreatment 2 SCR Catalyst Reagent Tank Fill Valve opening. 100% means the fill valve is fully open providing maximum flow of reagent into the reagent tank.

Data Length: 1 byte  
Resolution: 0.4 %/bit, 0 offset  
Data Range: 0 to 100 %  
Type: Status  
Supporting Information:  
PGN reference: 64819

Operational Range: same as data range

**(R) SPN 5438      *Aftertreatment 2 SCR Catalyst Reagent Pump State***

State of aftertreatment 2 SCR Catalyst Reagent dosing pump.

00 pump operational  
01 pump error  
10 reserved for SAE assignment  
11 not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64819                    |                                       |

**(R) SPN 5439      *Aftertreatment 2 SCR Catalyst Reagent Tank Drain Valve Command***

Commanded percentage of maximum Aftertreatment 2 SCR Catalyst Reagent Tank Drain Valve opening. 100% means the the drain valve is fully open providing maximum flow of reagent out of the reagent tank.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 1 byte              |                                       |
| Resolution:             | 0.4 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 100 %          | Operational Range: same as data range |
| Type:                   | Status              |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64819               |                                       |

**(R) SPN 5444      *Engine Crankcase Breather Oil Separator Speed***

The speed of a rotating (centrifugal) crankcase oil separator.

|                         |                     |                                       |
|-------------------------|---------------------|---------------------------------------|
| Data Length:            | 2 bytes             |                                       |
| Resolution:             | 1 rpm/bit, 0 offset |                                       |
| Data Range:             | 0 to 64255 rpm      | Operational Range: same as data range |
| Type:                   | Measured            |                                       |
| Supporting Information: |                     |                                       |
| PGN reference:          | 64916               |                                       |

**(R) SPN 5445      Engine Throttle Valve 1 Operation Status**

Used to identify the status of Engine Throttle Valve 1

0000 – Normal  
0001 – Alarm (fully operational but needs service)  
0010 – Alarm High Severity (functional but transient performance may be reduced)  
0011 – Derate Active (torque output reduced due to environmental conditions)  
0100 – Controlled Shutdown Active (driving to the default position – usually this means closed)  
0101 – Uncontrolled Shutdown Active (actuator current is off so it is limp)  
0110 – 1101 Reserved for future assignment  
1110 – Error  
1111 – Not available

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64754                     |                                       |

**(R) SPN 5446      Engine Throttle Valve 2 Operation Status**

Used to identify the status of Engine Throttle Valve 2

0000 – Normal  
0001 – Alarm (fully operational but needs service)  
0010 – Alarm High Severity (functional but transient performance may be reduced)  
0011 – Derate Active (torque output reduced due to environmental conditions)  
0100 – Controlled Shutdown Active (driving to the default position – usually this means closed)  
0101 – Uncontrolled Shutdown Active (actuator current is off so it is limp)  
0110 – 1101 Reserved for future assignment  
1110 – Error

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64754                     |                                       |



**(R) SPN 5447      Engine Fuel Valve 1 Operation Status**

Used to identify the status of Engine Fuel Valve 1

0000 – Normal  
0001 – Alarm (fully operational but needs service)  
0010 – Alarm High Severity (functional but transient performance may be reduced)  
0011 – Derate Active (torque output reduced due to environmental conditions)  
0100 – Controlled Shutdown Active (driving to the default position – usually this means closed)  
0101 – Uncontrolled Shutdown Active (actuator current is off so it is limp)  
0110 – 1101 Reserved for future assignment  
1110 – Error

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64754                     |                                       |

**(R) SPN 5448      Engine Fuel Valve 2 Operation Status**

Used to identify the status of Engine Fuel Valve 2

0000 – Normal  
0001 – Alarm (fully operational but needs service)  
0010 – Alarm High Severity (functional but transient performance may be reduced)  
0011 – Derate Active (torque output reduced due to environmental conditions)  
0100 – Controlled Shutdown Active (driving to the default position – usually this means closed)  
0101 – Uncontrolled Shutdown Active (actuator current is off so it is limp)  
0110 – 1101 Reserved for future assignment  
1110 – Error

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64754                     |                                       |

**(R) SPN 5449      Engine Turbocharger Compressor Bypass Actuator 1 Operation Status**

Used to identify the status of Engine Turbocharger Compressor Bypass Actuator 1

0000 – Normal  
0001 – Alarm (fully operational but needs service)  
0010 – Alarm High Severity (functional but transient performance may be reduced)  
0011 – Derate Active (torque output reduced due to environmental conditions)  
0100 – Controlled Shutdown Active (driving to the default position – usually this means closed)  
0101 – Uncontrolled Shutdown Active (actuator current is off so it is limp)  
0110 – 1101 Reserved for future assignment  
1110 – Error

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64755                     |                                       |

**(R) SPN 5450      Engine Turbocharger Compressor Bypass Actuator 2 Operation Status**

Used to identify the status of Engine Turbocharger Compressor Bypass Actuator 2

0000 – Normal  
0001 – Alarm (fully operational but needs service)  
0010 – Alarm High Severity (functional but transient performance may be reduced)  
0011 – Derate Active (torque output reduced due to environmental conditions)  
0100 – Controlled Shutdown Active (driving to the default position – usually this means closed)  
0101 – Uncontrolled Shutdown Active (actuator current is off so it is limp)  
0110 – 1101 Reserved for future assignment  
1110 – Error

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64755                     |                                       |

**(R) SPN 5451      Engine Turbocharger Wastegate Actuator 1 Operation Status**

Used to identify the status of Engine Turbocharger Wastegate Actuator 1

0000 – Normal  
0001 – Alarm (fully operational but needs service)  
0010 – Alarm High Severity (functional but transient performance may be reduced)  
0011 – Derate Active (torque output reduced due to environmental conditions)  
0100 – Controlled Shutdown Active (driving to the default position – usually this means closed)  
0101 – Uncontrolled Shutdown Active (actuator current is off so it is limp)  
0110 – 1101 Reserved for future assignment  
1110 – Error

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64753                     |                                       |

**(R) SPN 5452      Engine Turbocharger Wastegate Actuator 2 Operation Status**

Used to identify the status of Engine Turbocharger Wastegate Actuator 2

0000 – Normal  
0001 – Alarm (fully operational but needs service)  
0010 – Alarm High Severity (functional but transient performance may be reduced)  
0011 – Derate Active (torque output reduced due to environmental conditions)  
0100 – Controlled Shutdown Active (driving to the default position – usually this means closed)  
0101 – Uncontrolled Shutdown Active (actuator current is off so it is limp)  
0110 – 1101 Reserved for future assignment  
1110 – Error

|                         |                           |                                       |
|-------------------------|---------------------------|---------------------------------------|
| Data Length:            | 4 bits                    |                                       |
| Resolution:             | 16 states/4 bit, 0 offset |                                       |
| Data Range:             | 0 to 15                   | Operational Range: same as data range |
| Type:                   | Status                    |                                       |
| Supporting Information: |                           |                                       |
| PGN reference:          | 64753                     |                                       |

**(R) SPN 5454      Aftertreatment 1 Average Time Between Active Regenerations**

Indicates the average time between active regenerations, that have not been forced to occur by manual request, for Aftertreatment device 1.

If the manufacturer allows this parameter to be reset, this average time is the average since last reset.

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 4 bytes              |                                       |
| Resolution:             | 1 s/bit, 0 offset    |                                       |
| Data Range:             | 0 to 4,211,081,215 s | Operational Range: same as data range |
| Type:                   | Status               |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 64920                |                                       |

**(R) SPN 5455      *Aftertreatment 2 Average Time Between Active Regenerations***

Indicates the average time since last reset between active regenerations, that have not been forced to occur by manual request, for Aftertreatment device 2.

|                         |                      |                                       |
|-------------------------|----------------------|---------------------------------------|
| Data Length:            | 4 bytes              |                                       |
| Resolution:             | 1 s/bit, 0 offset    |                                       |
| Data Range:             | 0 to 4,211,081,215 s | Operational Range: same as data range |
| Type:                   | Status               |                                       |
| Supporting Information: |                      |                                       |
| PGN reference:          | 64921                |                                       |

**(R) SPN 5456      *Aftertreatment 1 Hydrocarbon Doser Intake Fuel Temperature***

Measured temperature of the intake fuel to the hydrocarbon dosing device

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Data Length:            | 1 byte                        |                                       |
| Resolution:             | 1 deg C/bit, -40 deg C offset |                                       |
| Data Range:             | -40 to 210 deg C              | Operational Range: same as data range |
| Type:                   | Measured                      |                                       |
| Supporting Information: |                               |                                       |
| PGN reference:          | 64869                         |                                       |

**(R) SPN 5457      *Engine Variable Geometry Turbocharger 1 Control Mode***

Indicates if the variable geometry turbocharger control status is either open loop or closed loop.

00 open loop  
01 closed loop  
10 SAE reserved  
11 not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64981                    |                                       |

**(R) SPN 5458      *Flexible Fuel Percentage***

Measured signal that indicates the percentage of alcohol in the fuel currently being used. 0% means no alcohol in fuel, 100% means alcohol as fuel and nothing else.

|                         |                        |                              |
|-------------------------|------------------------|------------------------------|
| Data Length:            | 2 bytes                |                              |
| Resolution:             | 0.0025 %/bit, 0 offset |                              |
| Data Range:             | 0 to 160.6375 %        | Operational Range: 0 to 100% |
| Type:                   | Measured               |                              |
| Supporting Information: |                        |                              |
| PGN reference:          | 65203                  |                              |

**(R) SPN 5459      *Aftertreatment 1 NOx Adsorber deNOx Regeneration Status***

Indicates whether the NOx adsorber deNOx regeneration in the first aftertreatment system is active or inactive

00 Inactive  
01 Active  
10 Error indicator  
11 Not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 64748

Operational Range: same as data range

**(R) SPN 5460      *Aftertreatment 2 NOx Adsorber deNOx Regeneration Status***

Indicates whether the NOx adsorber deNOx regeneration in the second aftertreatment system is active or inactive

00 Inactive  
01 Active  
10 Error indicator  
11 Not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 64747

Operational Range: same as data range

**(R) SPN 5461      *Aftertreatment 1 NOx Adsorber deSOx Regeneration Status***

Indicates whether the NOx adsorber deSOx regeneration in the first aftertreatment system is active or inactive

00 Inactive  
01 Active  
10 Error indicator  
11 Not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 64748

Operational Range: same as data range

**(R) SPN 5462      *Aftertreatment 2 NOx Adsorber deSOx Regeneration Status***

Indicates whether the NOx adsorber deSOx regeneration in the second aftertreatment system is active or inactive

00 Inactive  
01 Active  
10 Error indicator  
11 Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64747                    |                                       |

**(R) SPN 5463      *Aftertreatment 1 SCR Operator Inducement Active Traveled Distance***

The distance traveled while SCR inducement (SPN 5246 is equal to level 1 to 5) is active. Distance is reset once inducement is no longer active (SPN 5246 = 0).

|                         |                    |                                       |
|-------------------------|--------------------|---------------------------------------|
| Data Length:            | 2 bytes            |                                       |
| Resolution:             | 1 km/bit, 0 offset |                                       |
| Data Range:             | 0 to 64,255 km     | Operational Range: same as data range |
| Type:                   | Measured           |                                       |
| Supporting Information: |                    |                                       |
| PGN reference:          | 64878              |                                       |

**(R) SPN 5464      *Hybrid Battery Pack Remaining Charge***

Indicates the hybrid battery pack remaining charge. 0% means no charge remaining, 100% means full charge remaining.

|                         |                        |                                       |
|-------------------------|------------------------|---------------------------------------|
| Data Length:            | 2 bytes                |                                       |
| Resolution:             | 0.0025 %/bit, 0 offset |                                       |
| Data Range:             | 0 to 160.6375 %        | Operational Range: same as data range |
| Type:                   | Measured               |                                       |
| Supporting Information: |                        |                                       |
| PGN reference:          | 64746                  |                                       |

**(R) SPN 5465      Engine Intake Manifold Pressure Control Mode**

Indicates that the Boost Pressure Closed Loop Control status either open loop or closed loop.

00 Open loop  
01 Closed loop  
10 SAE reserved  
11 Not available

Data Length: 2 bits  
Resolution: 4 states/2 bit, 0 offset  
Data Range: 0 to 3  
Type: Status  
Supporting Information:  
PGN reference: 65214

Operational Range: same as data range

**(R) SPN 5466      Aftertreatment 1 Diesel Particulate Filter Soot Load Regeneration Threshold**

This parameter indicates the value that will first cause DPF regeneration in aftertreatment 1. There may be multiple parameters that cause DPF regeneration (e.g. Percent Soot Load, DPF delta pressure converted to normalized percentage, etc..).

100% is the level at which active diesel particulate filter regeneration should be triggered. 100% level is the active regeneration trigger level (and if conditions are not favorable for regeneration, soot loading can continue beyond 100%). During normal operation and regeneration a value 0% will indicate a fully regenerated diesel particulate filter. Values of 25%, 50% and 75% will indicate the general level of soot prior to the 100% level where an active regeneration is needed.

Data Length: 2 bytes  
Resolution: 0.0025 %/bit, 0 offset  
Data Range: 0 to 160.6375 %  
Type: Status  
Supporting Information:  
PGN reference: 64891

Operational Range: same as data range

**(R) SPN 5467      Aftertreatment 2 Diesel Particulate Filter Soot Load Regeneration Threshold**

This parameter indicates the value that will first cause DPF regeneration in aftertreatment 2. There may be multiple parameters that cause DPF regeneration (e.g. Percent Soot Load, DPF delta pressure converted to normalized percentage, etc..).

100% is the level at which active diesel particulate filter regeneration should be triggered. 100% level is the active regeneration trigger level (and if conditions are not favorable for regeneration, soot loading can continue beyond 100%). During normal operation and regeneration a value 0% will indicate a fully regenerated diesel particulate filter. Values of 25%, 50% and 75% will indicate the general level of soot prior to the 100% level where an active regeneration is needed.

Data Length: 2 bytes  
Resolution: 0.0025 %/bit, 0 offset  
Data Range: 0 to 160.6375 %  
Type: Status  
Supporting Information:  
PGN reference: 64890

Operational Range: same as data range

**(R) SPN 5468      Engine Oil Relative Dielectricity (high resolution)**

Engine oil relative dielectricity used to describe the engine oil quality.

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bytes                  |                                       |
| Resolution:             | 1/8192 per bit, 0 offset |                                       |
| Data Range:             | 0 to 7.844               | Operational Range: same as data range |
| Type:                   | Measured                 |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64776                    |                                       |

**(R) SPN 5469      Engine Fuel Filter Restricted Lamp Command**

Command signal directly controlling the Vehicle Fuel Filter Restricted Lamp.

00 - Lamp Off  
01 - Lamp On  
10 - Flash (1 hz)  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64775                    |                                       |

**(R) SPN 5470      Engine Fuel Filter Restricted Lamp Data**

Command signal directly controlling the Vehicle Fuel Filter Restricted Lamp.

00 - Lamp deactivated (Off)  
01 - Lamp activated (On)  
10 - Error  
11 - Not available

|                         |                          |                                       |
|-------------------------|--------------------------|---------------------------------------|
| Data Length:            | 2 bits                   |                                       |
| Resolution:             | 4 states/2 bit, 0 offset |                                       |
| Data Range:             | 0 to 3                   | Operational Range: same as data range |
| Type:                   | Status                   |                                       |
| Supporting Information: |                          |                                       |
| PGN reference:          | 64773                    |                                       |



**(R) SPN 5471      Engine Friction Percent Torque At Idle, Point 1**

The static portion of the friction torque at speed point 1 (SPN 188) of the engine torque map in the engine configuration message. This parameter does not include Estimated Pumping – Percent Torque (SPN 5398) and is expected to change with temperature. The data is transmitted as a percent of the reference engine torque (SPN 544).

|                         |                        |                              |
|-------------------------|------------------------|------------------------------|
| Data Length:            | 1 byte                 |                              |
| Resolution:             | 1 %/bit, -125 % offset |                              |
| Data Range:             | -125 to 125 %          | Operational Range: 0 to 125% |
| Type:                   | Measured               |                              |
| Supporting Information: |                        |                              |
| PGN reference:          | 64743                  |                              |

**(R) SPN 5472      Engine Friction Percent Torque At Idle, Point 2**

The static portion of the friction torque at speed point 2 (SPN 528) of the engine torque map in the engine configuration message. This parameter does not include Estimated Pumping – Percent Torque (SPN 5398) and is expected to change with temperature. The data is transmitted as a percent of the reference engine torque (SPN 544).

|                         |                        |                              |
|-------------------------|------------------------|------------------------------|
| Data Length:            | 1 byte                 |                              |
| Resolution:             | 1 %/bit, -125 % offset |                              |
| Data Range:             | -125 to 125 %          | Operational Range: 0 to 125% |
| Type:                   | Measured               |                              |
| Supporting Information: |                        |                              |
| PGN reference:          | 64743                  |                              |

**(R) SPN 5473      Engine Friction Percent Torque At Idle, Point 3**

The static portion of the friction torque at speed point 3 (SPN 529) of the engine torque map in the engine configuration message. This parameter does not include Estimated Pumping – Percent Torque (SPN 5398) and is expected to change with temperature. The data is transmitted as a percent of the reference engine torque (SPN 544).

|                         |                        |                              |
|-------------------------|------------------------|------------------------------|
| Data Length:            | 1 byte                 |                              |
| Resolution:             | 1 %/bit, -125 % offset |                              |
| Data Range:             | -125 to 125 %          | Operational Range: 0 to 125% |
| Type:                   | Measured               |                              |
| Supporting Information: |                        |                              |
| PGN reference:          | 64743                  |                              |

**(R) SPN 5474      Engine Friction Percent Torque At Idle, Point 4**

The static portion of the friction torque at speed point 4 (SPN 530) of the engine torque map in the engine configuration message. This parameter does not include Estimated Pumping – Percent Torque (SPN 5398) and is expected to change with temperature. The data is transmitted as a percent of the reference engine torque (SPN 544).

|                         |                        |                              |
|-------------------------|------------------------|------------------------------|
| Data Length:            | 1 byte                 |                              |
| Resolution:             | 1 %/bit, -125 % offset |                              |
| Data Range:             | -125 to 125 %          | Operational Range: 0 to 125% |
| Type:                   | Measured               |                              |
| Supporting Information: |                        |                              |
| PGN reference:          | 64743                  |                              |

**(R) SPN 5475      Engine Friction Percent Torque At Idle, Point 5**

The static portion of the friction torque at speed point 5 (SPN 531) of the engine torque map in the engine configuration message. This parameter does not include Estimated Pumping – Percent Torque (SPN 5398) and is expected to change with temperature. The data is transmitted as a percent of the reference engine torque (SPN 544).

|                         |                        |                              |
|-------------------------|------------------------|------------------------------|
| Data Length:            | 1 byte                 |                              |
| Resolution:             | 1 %/bit, -125 % offset |                              |
| Data Range:             | -125 to 125 %          | Operational Range: 0 to 125% |
| Type:                   | Measured               |                              |
| Supporting Information: |                        |                              |
| PGN reference:          | 64743                  |                              |

**(R) SPN 5476      Engine Friction Percent Torque At Idle, Point 6**

For engine configuration map modes 1 and 2, this is the static portion of the friction torque at speed point 6 (SPN 532) of the engine torque map. For engine configuration map mode 3, this parameter is the static portion of the friction torque at the engine speed calculated by using Engine Gain (Kp) Of The Endspped Governor (SPN 545) where torque is 0. This parameter does not include Estimated Pumping – Percent Torque (SPN 5398) and is expected to change with temperature. The data is transmitted as a percent of the reference engine torque (SPN 544)..

|                         |                        |                              |
|-------------------------|------------------------|------------------------------|
| Data Length:            | 1 byte                 |                              |
| Resolution:             | 1 %/bit, -125 % offset |                              |
| Data Range:             | -125 to 125 %          | Operational Range: 0 to 125% |
| Type:                   | Measured               |                              |
| Supporting Information: |                        |                              |
| PGN reference:          | 64743                  |                              |

**(R) SPN 5477      Engine Friction Percent Torque At Idle, Point 7**

The static portion of the friction torque at speed point 7 (SPN 533) of the engine torque map in the engine configuration message. This parameter does not include Estimated Pumping – Percent Torque (SPN 5398) and is expected to change with temperature. The data is transmitted as a percent of the reference engine torque (SPN 544).

|                         |                        |                              |
|-------------------------|------------------------|------------------------------|
| Data Length:            | 1 byte                 |                              |
| Resolution:             | 1 %/bit, -125 % offset |                              |
| Data Range:             | -125 to 125 %          | Operational Range: 0 to 125% |
| Type:                   | Measured               |                              |
| Supporting Information: |                        |                              |
| PGN reference:          | 64743                  |                              |

**(R) SPN 5492      Armrest Switch Matrix - Switch 2**

Second switch input matrix for the module located in the armrest

00 : Off  
01: On  
10: Reserved  
11: Don't care/take no action

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64745

Operational Range: same as data range

**(R) SPN 5493      Armrest Switch Matrix 2 - Switch 1**

Switch input matrix for the second module located in the armrest

00 : Off  
01: On  
10: Reserved  
11: Don't care/take no action

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64745

Operational Range: same as data range

**(R) SPN 5494      Armrest Switch Matrix 2 - Switch 2**

Second switch input matrix for the second module located in the armrest

00 : Off  
01: On  
10: Reserved  
11: Don't care/take no action

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64745

Operational Range: same as data range

**(R) SPN 5495      *Aftertreatment 1 Diesel Particulate Filter Soot Mean Calibration Offset***

Calibration offset for the soot Mean for Aftertreatment 1 Diesel Particulate Filter soot sensor.

Data Length: 2 bytes  
Resolution: 0.0025 %/bit, 0 offset  
Data Range: 0 to 160.6375 %      Operational Range: same as data range  
Type: Status  
Supporting Information:  
PGN reference: 37888

**(R) SPN 5496      *Aftertreatment 1 Diesel Particulate Filter Soot Standard Deviation Calibration Offset***

Calibration offset for the soot standard deviation for Aftertreatment 1 Diesel Particulate Filter soot sensor.

Data Length: 2 bytes  
Resolution: 0.0025 %/bit, 0 offset  
Data Range: 0 to 160.6375 %      Operational Range: same as data range  
Type: Status  
Supporting Information:  
PGN reference: 37888

**(R) SPN 5497      *Aftertreatment 2 Diesel Particulate Filter Soot Mean Calibration Offset***

Calibration offset for the soot Mean for Aftertreatment 2 Diesel Particulate Filter soot sensor.

Data Length: 2 bytes  
Resolution: 0.0025 %/bit, 0 offset  
Data Range: 0 to 160.6375 %      Operational Range: same as data range  
Type: Status  
Supporting Information:  
PGN reference: 38144

**(R) SPN 5498      *Aftertreatment 2 Diesel Particulate Filter Soot Standard Deviation Calibration Offset***

Calibration offset for the soot standard deviation for Aftertreatment 2 Diesel Particulate Filter soot sensor.

Data Length: 2 bytes  
Resolution: 0.0025 %/bit, 0 offset  
Data Range: 0 to 160.6375 %      Operational Range: same as data range  
Type: Status  
Supporting Information:  
PGN reference: 38144

**(R) SPN 5499      Intake Valve Actuation System Oil Pressure 1 Solenoid Control**

Indicates the current command to the solenoid that controls the intake valve actuation system oil pressure 1 valve. This valve opens or closes a connection from the intake valve actuation oil rail to tank.

00 off  
01 on  
10 reserved for SAE assignment  
11 not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64744

Operational Range: same as data range

**(R) SPN 5500      Intake Valve Actuation System Oil Pressure 2 Solenoid Control**

Indicates the current command to the solenoid that controls the intake valve actuation system oil pressure 2 valve. This valve opens or closes a connection from the intake valve actuation oil rail to tank.

00 off  
01 on  
10 reserved for SAE assignment  
11 not available

Data Length:            2 bits  
Resolution:            4 states/2 bit, 0 offset  
Data Range:            0 to 3  
Type:                    Status  
Supporting Information:  
PGN reference:        64744

Operational Range: same as data range

## APPENDIX C

### PGNs

**PGN 0*****Torque/Speed Control 1******TSC1***

NOTE - Retarder may be disabled by commanding a torque limit of 0%. Use of the limit mode allows the use of the retarder only up to the limit specified in the request. This can be used to permit retarding of up to 50%, for example, if that limit is required by some device such as an EBS, or it can disable the use of the retarder by others, as when an ABS controller detects wheel slip.

Note that the 10 ms transmission repetition rate is intended for temporary powertrain control (P32 of SPN 3350). Slower transmission rates (for control purposes P1 through P31 of SPN 3350) may be supported for longer duration control.

|                               |                                               |
|-------------------------------|-----------------------------------------------|
| Transmission Repetition Rate: | To engine: Control Purpose dependent or 10 ms |
| To retarder: 50 ms            |                                               |
| Data Length:                  | 8                                             |
| Extended Data Page:           | 0                                             |
| Data Page:                    | 0                                             |
| PDU Format:                   | 0                                             |
| PDU Specific:                 | DA PGN Supporting Information:                |
| Default Priority:             | 3                                             |
| Parameter Group Number:       | 0 (0x000000)                                  |

| Start Position | Length  | Parameter Name                            | SPN  |
|----------------|---------|-------------------------------------------|------|
| 1.1            | 2 bits  | Engine Override Control Mode              | 695  |
| 1.3            | 2 bits  | Engine Requested Speed Control Conditions | 696  |
| 1.5            | 2 bits  | Override Control Mode Priority            | 897  |
| 2-3            | 2 bytes | Engine Requested Speed/Speed Limit        | 898  |
| 4              | 1 byte  | Engine Requested Torque/Torque Limit      | 518  |
| 5.1            | 3 bits  | TSC1 Transmission Rate                    | 3349 |
| 5.4            | 5 bits  | TSC1 Control Purpose                      | 3350 |
| 6.1            | 4 bits  | Engine Requested Torque - High Resolution | 4191 |
| 8.1            | 4 bits  | Message Counter                           | 4206 |
| 8.5            | 4 bits  | Message Checksum                          | 4207 |

**PGN 256****Transmission Control 1****TC1**

Transmission Repetition Rate: When active; 50 ms to transmission and axles  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 1  
 PDU Specific: DA PGN Supporting Information:  
 Default Priority: 3  
 Parameter Group Number: 256 (0x000100)

| Start Position | Length | Parameter Name                                       | SPN  |
|----------------|--------|------------------------------------------------------|------|
| 1.1            | 2 bits | Transmission Gear Shift Inhibit Request              | 681  |
| 1.3            | 2 bits | Transmission Torque Converter Lockup Disable Request | 682  |
| 1.5            | 2 bits | Disengage Driveline Request                          | 683  |
| 1.7            | 2 bits | Transmission Reverse Gear Shift Inhibit Request      | 4242 |
| 2              | 1 byte | Requested Percent Clutch Slip                        | 684  |
| 3              | 1 byte | Transmission Requested Gear                          | 525  |
| 4.1            | 2 bits | Disengage Differential Lock Request - Front Axle 1   | 685  |
| 4.3            | 2 bits | Disengage Differential Lock Request - Front Axle 2   | 686  |
| 4.5            | 2 bits | Disengage Differential Lock Request - Rear Axle 1    | 687  |
| 4.7            | 2 bits | Disengage Differential Lock Request - Rear Axle 2    | 688  |
| 5.1            | 2 bits | Disengage Differential Lock Request - Central        | 689  |
| 5.3            | 2 bits | Disengage Differential Lock Request - Central Front  | 690  |
| 5.5            | 2 bits | Disengage Differential Lock Request - Central Rear   | 691  |
| 6.1            | 2 bits | Transmission Mode 1                                  | 1852 |
| 6.3            | 2 bits | Transmission Mode 2                                  | 1853 |
| 6.5            | 2 bits | Transmission Mode 3                                  | 1854 |
| 6.7            | 2 bits | Transmission Mode 4                                  | 1855 |
| 7.3            | 4 bits | Transmission Requested Launch Gear                   | 4255 |
| 7.7            | 2 bits | Transmission Shift Selector Display Mode Switch      | 2985 |
| 8.1            | 2 bits | Transmission Mode 5                                  | 4246 |
| 8.3            | 2 bits | Transmission Mode 6                                  | 4247 |
| 8.5            | 2 bits | Transmission Mode 7                                  | 4248 |
| 8.7            | 2 bits | Transmission Mode 8                                  | 4249 |

**PGN 1024****External Brake Request****XBR**

Used for brake control by an external device. The receiver is the brake system controlling the axle and/or wheel brakes. This system has to process the demanded acceleration. Note: This PGN shall not be used for external control of engine, engine brakes (engine retarders) or driveline retarders. Use TSC1 PGN instead.

Transmission Repetition Rate: When active: 20 ms; else 200 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 4  
 PDU Specific: DA PGN Supporting Information: See Appendix D - PGN 1024  
 Default Priority: 3  
 Parameter Group Number: 1024 (0x000400)

| Start Position | Length  | Parameter Name               | SPN  |
|----------------|---------|------------------------------|------|
| 1-2            | 2 bytes | External Acceleration Demand | 2920 |
| 3.1            | 2 bits  | XBR EBI Mode                 | 2914 |
| 3.3            | 2 bits  | XBR Priority                 | 2915 |
| 3.5            | 2 bits  | XBR Control Mode             | 2916 |
| 4              | 1 byte  | XBR urgency                  | 4099 |
| 8.1            | 4 bits  | XBR Message Counter          | 3189 |
| 8.5            | 4 bits  | XBR Message Checksum         | 3188 |

**PGN 1792****General Purpose Valve Pressure****GPV4**

The measured load sense pressure and pilot pressure of a valve. May also include the load sense and supply pressure for a valve assembly, when available.

Transmission Repetition Rate: 100 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 7  
PDU Specific: DA PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 1792 (0x000700)

| Start Position | Length  | Parameter Name                     | SPN  |
|----------------|---------|------------------------------------|------|
| 1-2            | 2 bytes | Valve Load Sense Pressure          | 4086 |
| 3              | 1 byte  | Valve Pilot Pressure               | 4087 |
| 4-5            | 2 bytes | Valve Assembly Load sense Pressure | 4088 |
| 6-7            | 2 bytes | Valve Assembly Supply Pressure     | 4089 |

**PGN 2048****Auxiliary Input/Output Status 5****AUXIO5**

Notes:

Implementers are encouraged to use specific functional SPNs whenever possible.

AUXIO PGNs are intended for two categories of use in which fixed mapping to functions is not possible:

- 1) Generic I/O devices
  - 2) Applications lacking defined input and output functionality.
- Use, or request new, functionally defined parameters in all other cases.

Implementers and integrators considering using AUXIO PGNs should be cautious of conflicts that can arise from multiple users on a single system.

Transmission Repetition Rate: Manufacturer defined, not faster than 20 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 8  
PDU Specific: DA PGN Supporting Information:  
Default Priority: 3  
Parameter Group Number: 2048 (0x000800)

| Start Position | Length  | Parameter Name           | SPN  |
|----------------|---------|--------------------------|------|
| 1-2            | 2 bytes | Auxiliary I/O Channel #6 | 4155 |
| 3-4            | 2 bytes | Auxiliary I/O Channel #5 | 4156 |
| 5-6            | 2 bytes | Auxiliary I/O Channel #4 | 4157 |
| 7-8            | 2 bytes | Auxiliary I/O Channel #3 | 4158 |



**(R) PGN 37888      Aftertreatment 1 Diesel Particulate Filter Soot Sensor Calibration****AT1DPFSSC**

The purpose of this PGN is to group the Aftertreatment 1 DPF soot measurement calibration parameters. These values include soot sensor signal mean and standard deviation calibration levels. These calibration levels are associated with Diesel Particulate Filter 1 Soot 2 PGN 64761.

Transmission Repetition Rate:      On powerup and on request  
Data Length:                              8  
Extended Data Page:                      0  
Data Page:                                  0  
PDU Format:                                148  
PDU Specific:                              DA                      PGN Supporting Information:  
Default Priority:                          8  
Parameter Group Number:                37888 (0x009400)

| Start Position | Length  | Parameter Name                                                                        | SPN  |
|----------------|---------|---------------------------------------------------------------------------------------|------|
| 1-2            | 2 bytes | Aftertreatment 1 Diesel Particulate Filter Soot Mean Calibration Offset               | 5495 |
| 3-4            | 2 bytes | Aftertreatment 1 Diesel Particulate Filter Soot Standard Deviation Calibration Offset | 5496 |

**(R) PGN 38144      Aftertreatment 2 Diesel Particulate Filter Soot Sensor Calibration****AT2DPFSSC**

The purpose of this PGN is to group the Aftertreatment 2 DPF soot measurement calibration parameters. These values include soot sensor signal mean and standard deviation calibration levels. These calibration levels are associated with Diesel Particulate Filter 2 Soot 2 PGN 64760.

Transmission Repetition Rate:      On powerup and on request  
Data Length:                              8  
Extended Data Page:                      0  
Data Page:                                  0  
PDU Format:                                149  
PDU Specific:                              DA                      PGN Supporting Information:  
Default Priority:                          8  
Parameter Group Number:                38144 (0x009500)

| Start Position | Length  | Parameter Name                                                                        | SPN  |
|----------------|---------|---------------------------------------------------------------------------------------|------|
| 1-2            | 2 bytes | Aftertreatment 2 Diesel Particulate Filter Soot Mean Calibration Offset               | 5497 |
| 3-4            | 2 bytes | Aftertreatment 2 Diesel Particulate Filter Soot Standard Deviation Calibration Offset | 5498 |

**(R) PGN 38400 Low Voltage Disconnect Set Operating Mode****LVDSOM**

Low Voltage Disconnect (LVD) Set Operating Mode is sent to the LVD to either manually override the normal LVD function and force the outputs to be disconnected or connected, or to put the LVD back into normal mode.

Transmission Repetition Rate: As required but no more often than 500 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 150  
PDU Specific: DA PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 38400 (0x009600)

| Start Position | Length | Parameter Name                                | SPN  |
|----------------|--------|-----------------------------------------------|------|
| 1.1            | 4 bits | Low Voltage Disconnect Desired Operating Mode | 5149 |

**(R) PGN 38656 Noise Control Status****NCS**

Used to report the current state of the Noise Control System.

Transmission Repetition Rate: Every 10 seconds and on change of state, but not faster than 1 second. Every second when in tuning mode.  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 151  
PDU Specific: DA PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 38656 (0x009700)

| Start Position | Length | Parameter Name                  | SPN  |
|----------------|--------|---------------------------------|------|
| 1.1            | 2 bits | Cab Noise Control Status        | 5059 |
| 1.3            | 4 bits | Cab Noise Control Tuning Status | 5060 |

**(R) PGN 38912 Noise Control 1****NC1**

Used to issue commands to the Noise Control System. This command PGN typically originates from either a Cab control panel or a diagnostic tool.

Transmission Repetition Rate: Every 10 seconds and on change of state, but not faster than every 1 second.  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 152  
PDU Specific: DA PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 38912 (0x009800)

| Start Position | Length | Parameter Name                 | SPN  |
|----------------|--------|--------------------------------|------|
| 1.1            | 2 bits | Cab Noise Control State        | 5057 |
| 1.3            | 3 bits | Cab Noise Control Tuning State | 5058 |

**PGN 39168 Joystick Lamp Command Message****JLCM**

Used to transfer joystick lamp command informations which are used to switch on/off/blinking joystick 1...3 lamps 1...10.

Transmission Repetition Rate: 100 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 153  
PDU Specific: DA PGN Supporting Information:  
Default Priority: 3  
Parameter Group Number: 39168 (0x009900)

| Start Position | Length | Parameter Name             | SPN  |
|----------------|--------|----------------------------|------|
| 1.1            | 2 bits | Joystick 1 Lamp 1 Command  | 4460 |
| 1.3            | 2 bits | Joystick 1 Lamp 2 Command  | 4461 |
| 1.5            | 2 bits | Joystick 1 Lamp 3 Command  | 4462 |
| 1.7            | 2 bits | Joystick 1 Lamp 4 Command  | 4463 |
| 2.1            | 2 bits | Joystick 1 Lamp 5 Command  | 4464 |
| 2.3            | 2 bits | Joystick 1 Lamp 6 Command  | 4465 |
| 2.5            | 2 bits | Joystick 1 Lamp 7 Command  | 4466 |
| 2.7            | 2 bits | Joystick 1 Lamp 8 Command  | 4467 |
| 3.1            | 2 bits | Joystick 1 Lamp 9 Command  | 4468 |
| 3.3            | 2 bits | Joystick 1 Lamp 10 Command | 4469 |
| 3.5            | 2 bits | Joystick 2 Lamp 1 Command  | 4470 |
| 3.7            | 2 bits | Joystick 2 Lamp 2 Command  | 4471 |
| 4.1            | 2 bits | Joystick 2 Lamp 3 Command  | 4472 |
| 4.3            | 2 bits | Joystick 2 Lamp 4 Command  | 4473 |
| 4.5            | 2 bits | Joystick 2 Lamp 5 Command  | 4474 |
| 4.7            | 2 bits | Joystick 2 Lamp 6 Command  | 4475 |
| 5.1            | 2 bits | Joystick 2 Lamp 7 Command  | 4476 |
| 5.3            | 2 bits | Joystick 2 Lamp 8 Command  | 4477 |
| 5.5            | 2 bits | Joystick 2 Lamp 9 Command  | 4478 |
| 5.7            | 2 bits | Joystick 2 Lamp 10 Command | 4479 |
| 6.1            | 2 bits | Joystick 3 Lamp 1 Command  | 4480 |
| 6.3            | 2 bits | Joystick 3 Lamp 2 Command  | 4481 |
| 6.5            | 2 bits | Joystick 3 Lamp 3 Command  | 4482 |
| 6.7            | 2 bits | Joystick 3 Lamp 4 Command  | 4483 |
| 7.1            | 2 bits | Joystick 3 Lamp 5 Command  | 4484 |
| 7.3            | 2 bits | Joystick 3 Lamp 6 Command  | 4485 |
| 7.5            | 2 bits | Joystick 3 Lamp 7 Command  | 4486 |
| 7.7            | 2 bits | Joystick 3 Lamp 8 Command  | 4487 |
| 8.1            | 2 bits | Joystick 3 Lamp 9 Command  | 4488 |
| 8.3            | 2 bits | Joystick 3 Lamp 10 Command | 4489 |

**PGN 39680 Proprietary Method Identification****PMI**

This is a standardized mechanism for an ECU to report a listing of the manufacturer specific (i.e. proprietary) methods and formats it supports when using the PropA, PropA2, and PropB PGNs (see J1939-21). The ability to support multiple manufacturer proprietary methods allows manufacturers to collaborate on application specific communication needs that are not of interest to the SAE J1939 committee. The process of selecting a specific method for ECUs that list multiple mutually exclusive methods is intended to be defined by the manufacturer and therefore not within the scope of this PGN.

NOTE—The placement of the Data Dictionary Manufacturer Code and Data Dictionary Method bits into the 4-byte space is illustrated in Figure 39680\_A (See Appendix D).

|                               |                  |                                                        |
|-------------------------------|------------------|--------------------------------------------------------|
| Transmission Repetition Rate: | On request       |                                                        |
| Data Length:                  | Variable         |                                                        |
| Extended Data Page:           | 0                |                                                        |
| Data Page:                    | 0                |                                                        |
| PDU Format:                   | 155              |                                                        |
| PDU Specific:                 | DA               | PGN Supporting Information: See Appendix D - PGN 39680 |
| Default Priority:             | 6                |                                                        |
| Parameter Group Number:       | 39680 (0x009B00) |                                                        |

| Start Position | Length  | Parameter Name                    | SPN  |
|----------------|---------|-----------------------------------|------|
| 1-2.1          | 11 bits | Data Dictionary Manufacturer Code | 4180 |
| 2.4-4          | 21 bits | Data Dictionary Method            | 4181 |

**PGN 39936 Auxiliary Input/Output Status 7****AUXIO7**

Notes:

Implementers are encouraged to use specific functional SPNs whenever possible.

AUXIO PGNs are intended for two categories of use in which fixed mapping to functions is not possible:

- 1) Generic I/O devices
  - 2) Applications lacking defined input and output functionality.
- Use, or request new, functionally defined parameters in all other cases.

Implementers and integrators considering using AUXIO PGNs should be cautious of conflicts that can arise from multiple users on a single system.

|                               |                                              |
|-------------------------------|----------------------------------------------|
| Transmission Repetition Rate: | manufacturer defined, not faster than 100 ms |
| Data Length:                  | 8                                            |
| Extended Data Page:           | 0                                            |
| Data Page:                    | 0                                            |
| PDU Format:                   | 156                                          |
| PDU Specific:                 | DA PGN Supporting Information:               |
| Default Priority:             | 6                                            |
| Parameter Group Number:       | 39936 (0x009C00)                             |

| Start Position | Length | Parameter Name            | SPN  |
|----------------|--------|---------------------------|------|
| 1              | 1 byte | Auxiliary I/O Channel #18 | 4167 |
| 2              | 1 byte | Auxiliary I/O Channel #17 | 4168 |
| 3              | 1 byte | Auxiliary I/O Channel #16 | 4169 |
| 4              | 1 byte | Auxiliary I/O Channel #15 | 4170 |
| 5              | 1 byte | Auxiliary I/O Channel #22 | 4171 |
| 6              | 1 byte | Auxiliary I/O Channel #21 | 4172 |
| 7              | 1 byte | Auxiliary I/O Channel #20 | 4173 |
| 8              | 1 byte | Auxiliary I/O Channel #19 | 4174 |

**PGN 40192****Auxiliary Input/Output Status 6****AUXIO6**

## Notes:

Implementers are encouraged to use specific functional SPNs whenever possible.

AUXIO PGNs are intended for two categories of use in which fixed mapping to functions is not possible:

- 1) Generic I/O devices
- 2) Applications lacking defined input and output functionality.

Use, or request new, functionally defined parameters in all other cases.

Implementers and integrators considering using AUXIO PGNs should be cautious of conflicts that can arise from multiple users on a single system.

|                               |                                              |
|-------------------------------|----------------------------------------------|
| Transmission Repetition Rate: | manufacturer defined, not faster than 100 ms |
| Data Length:                  | 8                                            |
| Extended Data Page:           | 0                                            |
| Data Page:                    | 0                                            |
| PDU Format:                   | 157                                          |
| PDU Specific:                 | DA                                           |
| Default Priority:             | 6                                            |
| Parameter Group Number:       | 40192 (0x009D00)                             |

## PGN Supporting Information:

| Start Position | Length | Parameter Name            | SPN  |
|----------------|--------|---------------------------|------|
| 1              | 1 byte | Auxiliary I/O Channel #10 | 4159 |
| 2              | 1 byte | Auxiliary I/O Channel #9  | 4160 |
| 3              | 1 byte | Auxiliary I/O Channel #8  | 4161 |
| 4              | 1 byte | Auxiliary I/O Channel #7  | 4162 |
| 5              | 1 byte | Auxiliary I/O Channel #14 | 4163 |
| 6              | 1 byte | Auxiliary I/O Channel #13 | 4164 |
| 7              | 1 byte | Auxiliary I/O Channel #12 | 4165 |
| 8              | 1 byte | Auxiliary I/O Channel #11 | 4166 |

**(R) PGN 42240 Auxiliary Input/Output Status 4****AUXIO4**

## Notes:

Implementers are encouraged to use specific functional SPNs whenever possible.

AUXIO PGNs are intended for two categories of use in which fixed mapping to functions is not possible:

- 1) Generic I/O devices
- 2) Applications lacking defined input and output functionality.

Use, or request new, functionally defined parameters in all other cases.

Implementers and integrators considering using AUXIO PGNs should be cautious of conflicts that can arise from multiple users on a single system.

|                               |                                              |                             |  |
|-------------------------------|----------------------------------------------|-----------------------------|--|
| Transmission Repetition Rate: | Manufacturer defined, not faster than 100 ms |                             |  |
| Data Length:                  | 8                                            |                             |  |
| Extended Data Page:           | 0                                            |                             |  |
| Data Page:                    | 0                                            |                             |  |
| PDU Format:                   | 165                                          |                             |  |
| PDU Specific:                 | DA                                           | PGN Supporting Information: |  |
| Default Priority:             | 6                                            |                             |  |
| Parameter Group Number:       | 42240 (0x00A500)                             |                             |  |

| Start Position | Length | Parameter Name     | SPN  |
|----------------|--------|--------------------|------|
| 1.1            | 2 bits | Auxiliary I/O #84  | 3907 |
| 1.3            | 2 bits | Auxiliary I/O #83  | 3906 |
| 1.5            | 2 bits | Auxiliary I/O #82  | 3905 |
| 1.7            | 2 bits | Auxiliary I/O #81  | 3904 |
| 2.1            | 2 bits | Auxiliary I/O #88  | 3911 |
| 2.3            | 2 bits | Auxiliary I/O #87  | 3910 |
| 2.5            | 2 bits | Auxiliary I/O #86  | 3909 |
| 2.7            | 2 bits | Auxiliary I/O #85  | 3908 |
| 3.1            | 2 bits | Auxiliary I/O #92  | 3915 |
| 3.3            | 2 bits | Auxiliary I/O #91  | 3914 |
| 3.5            | 2 bits | Auxiliary I/O #90  | 3913 |
| 3.7            | 2 bits | Auxiliary I/O #89  | 3912 |
| 4.1            | 2 bits | Auxiliary I/O #96  | 3919 |
| 4.3            | 2 bits | Auxiliary I/O #95  | 3918 |
| 4.5            | 2 bits | Auxiliary I/O #94  | 3917 |
| 4.7            | 2 bits | Auxiliary I/O #93  | 3916 |
| 5.1            | 2 bits | Auxiliary I/O #100 | 3923 |
| 5.3            | 2 bits | Auxiliary I/O #99  | 3922 |
| 5.5            | 2 bits | Auxiliary I/O #98  | 3921 |
| 5.7            | 2 bits | Auxiliary I/O #97  | 3920 |
| 6.1            | 2 bits | Auxiliary I/O #104 | 3927 |
| 6.3            | 2 bits | Auxiliary I/O #103 | 3926 |
| 6.5            | 2 bits | Auxiliary I/O #102 | 3925 |
| 6.7            | 2 bits | Auxiliary I/O #101 | 3924 |
| 7.1            | 2 bits | Auxiliary I/O #108 | 3931 |
| 7.3            | 2 bits | Auxiliary I/O #107 | 3930 |
| 7.5            | 2 bits | Auxiliary I/O #106 | 3929 |
| 7.7            | 2 bits | Auxiliary I/O #105 | 3928 |
| 8.1            | 2 bits | Auxiliary I/O #112 | 3935 |
| 8.3            | 2 bits | Auxiliary I/O #111 | 3934 |
| 8.5            | 2 bits | Auxiliary I/O #110 | 3933 |
| 8.7            | 2 bits | Auxiliary I/O #109 | 3932 |

**(R) PGN 42496      Auxiliary Input/Output Status 3****AUXIO3****Notes:**

Implementers are encouraged to use specific functional SPNs whenever possible.

AUXIO PGNs are intended for two categories of use in which fixed mapping to functions is not possible:

- 1) Generic I/O devices
- 2) Applications lacking defined input and output functionality.

Use, or request new, functionally defined parameters in all other cases.

Implementers and integrators considering using AUXIO PGNs should be cautious of conflicts that can arise from multiple users on a single system.

|                               |                                              |                             |  |
|-------------------------------|----------------------------------------------|-----------------------------|--|
| Transmission Repetition Rate: | Manufacturer defined, not faster than 100 ms |                             |  |
| Data Length:                  | 8                                            |                             |  |
| Extended Data Page:           | 0                                            |                             |  |
| Data Page:                    | 0                                            |                             |  |
| PDU Format:                   | 166                                          |                             |  |
| PDU Specific:                 | DA                                           | PGN Supporting Information: |  |
| Default Priority:             | 6                                            |                             |  |
| Parameter Group Number:       | 42496 (0x00A600)                             |                             |  |

| Start Position | Length | Parameter Name    | SPN  |
|----------------|--------|-------------------|------|
| 1.1            | 2 bits | Auxiliary I/O #52 | 3875 |
| 1.3            | 2 bits | Auxiliary I/O #51 | 3874 |
| 1.5            | 2 bits | Auxiliary I/O #50 | 3873 |
| 1.7            | 2 bits | Auxiliary I/O #49 | 3872 |
| 2.1            | 2 bits | Auxiliary I/O #56 | 3879 |
| 2.3            | 2 bits | Auxiliary I/O #55 | 3878 |
| 2.5            | 2 bits | Auxiliary I/O #54 | 3877 |
| 2.7            | 2 bits | Auxiliary I/O #53 | 3876 |
| 3.1            | 2 bits | Auxiliary I/O #60 | 3883 |
| 3.3            | 2 bits | Auxiliary I/O #59 | 3882 |
| 3.5            | 2 bits | Auxiliary I/O #58 | 3881 |
| 3.7            | 2 bits | Auxiliary I/O #57 | 3880 |
| 4.1            | 2 bits | Auxiliary I/O #64 | 3887 |
| 4.3            | 2 bits | Auxiliary I/O #63 | 3886 |
| 4.5            | 2 bits | Auxiliary I/O #62 | 3885 |
| 4.7            | 2 bits | Auxiliary I/O #61 | 3884 |
| 5.1            | 2 bits | Auxiliary I/O #68 | 3891 |
| 5.3            | 2 bits | Auxiliary I/O #67 | 3890 |
| 5.5            | 2 bits | Auxiliary I/O #66 | 3889 |
| 5.7            | 2 bits | Auxiliary I/O #65 | 3888 |
| 6.1            | 2 bits | Auxiliary I/O #72 | 3895 |
| 6.3            | 2 bits | Auxiliary I/O #71 | 3894 |
| 6.5            | 2 bits | Auxiliary I/O #70 | 3893 |
| 6.7            | 2 bits | Auxiliary I/O #69 | 3892 |
| 7.1            | 2 bits | Auxiliary I/O #76 | 3899 |
| 7.3            | 2 bits | Auxiliary I/O #75 | 3898 |
| 7.5            | 2 bits | Auxiliary I/O #74 | 3897 |
| 7.7            | 2 bits | Auxiliary I/O #73 | 3896 |
| 8.1            | 2 bits | Auxiliary I/O #80 | 3903 |
| 8.3            | 2 bits | Auxiliary I/O #79 | 3902 |
| 8.5            | 2 bits | Auxiliary I/O #78 | 3901 |
| 8.7            | 2 bits | Auxiliary I/O #77 | 3900 |

**PGN 42752****Auxiliary Input/Output Status 2****AUXIO2**

## Notes:

Implementers are encouraged to use specific functional SPNs whenever possible.

AUXIO PGNs are intended for two categories of use in which fixed mapping to functions is not possible:

- 1) Generic I/O devices
- 2) Applications lacking defined input and output functionality.

Use, or request new, functionally defined parameters in all other cases.

Implementers and integrators considering using AUXIO PGNs should be cautious of conflicts that can arise from multiple users on a single system.

|                               |                                              |                             |
|-------------------------------|----------------------------------------------|-----------------------------|
| Transmission Repetition Rate: | Manufacturer defined, not faster than 100 ms |                             |
| Data Length:                  | 8                                            |                             |
| Extended Data Page:           | 0                                            |                             |
| Data Page:                    | 0                                            |                             |
| PDU Format:                   | 167                                          |                             |
| PDU Specific:                 | DA                                           | PGN Supporting Information: |
| Default Priority:             | 6                                            |                             |
| Parameter Group Number:       | 42752 (0x00A700)                             |                             |

| Start Position | Length | Parameter Name    | SPN  |
|----------------|--------|-------------------|------|
| 1.1            | 2 bits | Auxiliary I/O #20 | 3843 |
| 1.3            | 2 bits | Auxiliary I/O #19 | 3842 |
| 1.5            | 2 bits | Auxiliary I/O #18 | 3841 |
| 1.7            | 2 bits | Auxiliary I/O #17 | 3840 |
| 2.1            | 2 bits | Auxiliary I/O #24 | 3847 |
| 2.3            | 2 bits | Auxiliary I/O #23 | 3846 |
| 2.5            | 2 bits | Auxiliary I/O #22 | 3845 |
| 2.7            | 2 bits | Auxiliary I/O #21 | 3844 |
| 3.1            | 2 bits | Auxiliary I/O #28 | 3851 |
| 3.3            | 2 bits | Auxiliary I/O #27 | 3850 |
| 3.5            | 2 bits | Auxiliary I/O #26 | 3849 |
| 3.7            | 2 bits | Auxiliary I/O #25 | 3848 |
| 4.1            | 2 bits | Auxiliary I/O #32 | 3855 |
| 4.3            | 2 bits | Auxiliary I/O #31 | 3854 |
| 4.5            | 2 bits | Auxiliary I/O #30 | 3853 |
| 4.7            | 2 bits | Auxiliary I/O #29 | 3852 |
| 5.1            | 2 bits | Auxiliary I/O #36 | 3859 |
| 5.3            | 2 bits | Auxiliary I/O #35 | 3858 |
| 5.5            | 2 bits | Auxiliary I/O #34 | 3857 |
| 5.7            | 2 bits | Auxiliary I/O #33 | 3856 |
| 6.1            | 2 bits | Auxiliary I/O #40 | 3863 |
| 6.3            | 2 bits | Auxiliary I/O #39 | 3862 |
| 6.5            | 2 bits | Auxiliary I/O #38 | 3861 |
| 6.7            | 2 bits | Auxiliary I/O #37 | 3860 |
| 7.1            | 2 bits | Auxiliary I/O #44 | 3867 |
| 7.3            | 2 bits | Auxiliary I/O #43 | 3866 |
| 7.5            | 2 bits | Auxiliary I/O #42 | 3865 |
| 7.7            | 2 bits | Auxiliary I/O #41 | 3864 |
| 8.1            | 2 bits | Auxiliary I/O #48 | 3871 |
| 8.3            | 2 bits | Auxiliary I/O #47 | 3870 |
| 8.5            | 2 bits | Auxiliary I/O #46 | 3869 |
| 8.7            | 2 bits | Auxiliary I/O #45 | 3868 |



**PGN 43008      Text Display****DISP1**

This provides ASCII text information, for example to an display instrument. Broadcast rate should be on event and 1-5 seconds due to variable character length. This message is to convey information from an ecu to a display. In its most basic usage, it can be used to convey ASCII information to simple displays to show to the operator. The Text Display Characters will follow the standard J1939-71 display method. Control characters can be used but not displayed. The characters are to be terminated with a 00h or "null" character. Following bytes will be filled with FFh as usual. The null character will be used once per pgn transmission, regardless of character string length.

Byte 2 is reserved for future use, to incorporate priority.

|                               |                                           |
|-------------------------------|-------------------------------------------|
| Transmission Repetition Rate: | As required                               |
| Data Length:                  | Variable - up to 200 characters           |
| Extended Data Page:           | 0                                         |
| Data Page:                    | 0                                         |
| PDU Format:                   | 168                                       |
| PDU Specific:                 | DA            PGN Supporting Information: |
| Default Priority:             | 6                                         |
| Parameter Group Number:       | 43008 (0x00A800)                          |

| Start Position | Length                                                   | Parameter Name            | SPN  |
|----------------|----------------------------------------------------------|---------------------------|------|
| 1.1            | 4 bits                                                   | Text Display Instructions | 3613 |
| 3              | 1 byte                                                   | Text Display Index        | 3614 |
| 4 to n         | Variable - up to 200 bytes followed by an NULL delimiter | Text Display Character    | 3615 |

**PGN 43264      Forward Lane Image Command****FLIC**

Message containing commands, sent to the forward image controller

|                               |                                           |
|-------------------------------|-------------------------------------------|
| Transmission Repetition Rate: | On event                                  |
| Data Length:                  | 8                                         |
| Extended Data Page:           | 0                                         |
| Data Page:                    | 0                                         |
| PDU Format:                   | 169                                       |
| PDU Specific:                 | DA            PGN Supporting Information: |
| Default Priority:             | 6                                         |
| Parameter Group Number:       | 43264 (0x00A900)                          |

| Start Position | Length | Parameter Name                        | SPN  |
|----------------|--------|---------------------------------------|------|
| 1.1            | 2 bits | Lane Departure Warning Enable Command | 3564 |

**PGN 44544 Tire Pressure Reference Setting****TPRS**

For setting the tire pressure reference values.

This message is the setpoint for the PGN 64953 Tire Pressure reference information message.

Transmission Repetition Rate: As needed  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 174  
 PDU Specific: DA PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 44544 (0x00AE00)

| Start Position | Length | Parameter Name                  | SPN  |
|----------------|--------|---------------------------------|------|
| 1              | 8 bits | Tire Location                   | 3192 |
| 2              | 1 byte | Reference Tire Pressure Setting | 3193 |

**PGN 52992 Continuous Torque & Speed Limit Request****CTL**

Transmission Repetition Rate: 5 s  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 207  
 PDU Specific: DA PGN Supporting Information: See Appendix D - PGN 52992  
 Default Priority: 6  
 Parameter Group Number: 52992 (0x00CF00)

| Start Position | Length | Parameter Name                                   | SPN  |
|----------------|--------|--------------------------------------------------|------|
| 1              | 1 byte | Engine Speed Limit Request - Minimum Continuous  | 1784 |
| 2              | 1 byte | Engine Speed Limit Request - Maximum Continuous  | 1785 |
| 3              | 1 byte | Engine Torque Limit Request - Minimum Continuous | 1786 |
| 4              | 1 byte | Engine Torque Limit Request - Maximum Continuous | 1787 |
| 5              | 1 byte | Minimum Continuous Retarder Speed Limit Request  | 1788 |
| 6              | 1 byte | Maximum Continuous Retarder Speed Limit Request  | 1789 |
| 7              | 1 byte | Minimum Continuous Retarder Torque Limit Request | 1790 |
| 8              | 1 byte | Maximum Continuous Retarder Torque Limit Request | 1791 |

**PGN 53248 Cab Illumination Message****CL**

This message contains information that controls illumination devices inside the vehicle's cab.

Transmission Repetition Rate: Every 5 s and on change of state but no faster than every 100 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 208  
 PDU Specific: DA PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 53248 (0x00D000)

| Start Position | Length | Parameter Name                  | SPN  |
|----------------|--------|---------------------------------|------|
| 1              | 1 byte | Illumination Brightness Percent | 1487 |

**PGN 53504      Air Suspension Control 6****ASC6**

Used for suspension control

Transmission Repetition Rate: 100 ms when active  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 209  
 PDU Specific: DA      PGN Supporting Information:  
 Default Priority: 3  
 Parameter Group Number: 53504 (0x00D100)

| Start Position | Length  | Parameter Name                | SPN  |
|----------------|---------|-------------------------------|------|
| 1-2            | 2 bytes | Level Preset Front Axle Left  | 1732 |
| 3-4            | 2 bytes | Level Preset Front Axle Right | 1757 |
| 5-6            | 2 bytes | Level Preset Rear Axle Left   | 1758 |
| 7-8            | 2 bytes | Level Preset Rear Axle Right  | 1735 |

**(R) PGN 53760      Air Suspension Control 2****ASC2**

Used for suspension control

Transmission Repetition Rate: 100 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 210  
 PDU Specific: DA      PGN Supporting Information:  
 Default Priority: 3  
 Parameter Group Number: 53760 (0x00D200)

| Start Position | Length | Parameter Name                             | SPN  |
|----------------|--------|--------------------------------------------|------|
| 1.1            | 2 bits | Automatic traction help (load transfer)    | 2984 |
| 1.3            | 2 bits | Kneeling Request Left Side                 | 1749 |
| 1.5            | 2 bits | Kneeling Request Right Side                | 1748 |
| 1.7            | 2 bits | Kneeling Control Mode Request              | 1747 |
| 2.1            | 4 bits | Nominal Level Request Front Axle           | 1751 |
| 2.5            | 4 bits | Nominal Level Request Rear Axle            | 1750 |
| 3.1            | 4 bits | Level Control Mode Request                 | 1753 |
| 3.5            | 2 bits | Lift Axle 1 Position Command               | 1752 |
| 3.7            | 2 bits | Lift Axle 2 Position Command               | 1828 |
| 4              | 1 byte | Damper Stiffness Request Front Axle        | 1718 |
| 5              | 1 byte | Damper Stiffness Request Rear Axle         | 1719 |
| 6              | 1 byte | Damper Stiffness Request Lift / Tag Axle   | 1720 |
| 7.1            | 2 bits | Kneeling Command - Front Axle              | 1830 |
| 7.3            | 2 bits | Kneeling Command - Rear Axle               | 1829 |
| 7.5            | 2 bits | Prohibit air suspension control            | 3215 |
| 7.7            | 2 bits | Allow Level Control During Braking Command | 5293 |
| 8.1            | 2 bits | Speed Dependent Level Control Request      | 5295 |
| 8.3            | 2 bits | Prohibit Automatic Air Suspension Control  | 5274 |
| 8.5            | 4 bits | Memory level request                       | 5433 |

**PGN 54528****Time/Date Adjust****TDA**

Transmission Repetition Rate: As needed  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 213  
 PDU Specific: DA PGN Supporting Information: See Appendix D - PGN 65254  
 Default Priority: 6  
 Parameter Group Number: 54528 (0x00D500)

| Start Position | Length | Parameter Name             | SPN  |
|----------------|--------|----------------------------|------|
| 1              | 1 byte | Adjust seconds             | 1603 |
| 2              | 1 byte | Adjust minutes             | 1604 |
| 3              | 1 byte | Adjust hours               | 1605 |
| 4              | 1 byte | Adjust month               | 1606 |
| 5              | 1 byte | Adjust day                 | 1607 |
| 6              | 1 byte | Adjust year                | 1608 |
| 7              | 1 byte | Adjust local minute offset | 1609 |
| 8              | 1 byte | Adjust local hour offset   | 1610 |

**PGN 56320****Anti-theft Status****ATS**

NOTE—See Figures PGN56320\_A to PGN56320\_F for examples of Anti-theft message transfers. Bit 1 is the right most bit in each byte.

Transmission Repetition Rate: This message is transmitted in response to an Anti-Theft Request message. This message is also sent when the component has an abnormal power interruption. In this situation the Anti-Theft Status Report is sent without the Anti-Theft Request.  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 220  
 PDU Specific: DA PGN Supporting Information: See Appendix D - PGN 56320  
 Default Priority: 7  
 Parameter Group Number: 56320 (0x00DC00)

| Start Position | Length  | Parameter Name                               | SPN  |
|----------------|---------|----------------------------------------------|------|
| 1.1            | 2 bits  | Anti-theft Encryption Seed Present Indicator | 1194 |
| 1.3            | 2 bits  | Anti-theft Password Valid Indicator          | 1195 |
| 1.5            | 2 bits  | Anti-theft Component Status States           | 1196 |
| 1.7            | 2 bits  | Anti-theft Modify Password States            | 1197 |
| 2-8            | 7 bytes | Anti-theft Random Number                     | 1198 |

**(R) PGN 56576      Anti-theft Request****ATR**

NOTE—See Figures PGN56320\_A thru PGN56320\_F for examples of Anti-theft message transfers. Bit 1 is the right most bit in each byte.

Transmission Repetition Rate:      Transmission of this message is interrupt driven. This message is also transmitted upon power-up of the interfacing device sending this message.

Data Length:      8

Extended Data Page:      0

Data Page:      0

PDU Format:      221

PDU Specific:      DA      PGN Supporting Information:

Default Priority:      7

Parameter Group Number:      56576 (0x00DD00)

| Start Position | Length  | Parameter Name                         | SPN  |
|----------------|---------|----------------------------------------|------|
| 1.2            | 2 bits  | Anti-theft Encryption Indicator States | 1199 |
| 1.4            | 2 bits  | Anti-theft Desired Exit Mode States    | 1200 |
| 1.6            | 3 bits  | Anti-theft Command States              | 1201 |
| 2-8            | 7 bytes | Anti-theft Password Representation     | 1202 |

**PGN 56832      Reset****RESET**

NOTE—This message requires an Acknowledgement response (See J1939-21, PGN 59392) from the receiving node. The use of individual proprietary protocols can still be used instead of the "trip reset" PGN to maintain security.

Transmission Repetition Rate:      When needed

Data Length:      8

Extended Data Page:      0

Data Page:      0

PDU Format:      222

PDU Specific:      DA      PGN Supporting Information:

Default Priority:      7

Parameter Group Number:      56832 (0x00DE00)

| Start Position | Length | Parameter Name                         | SPN  |
|----------------|--------|----------------------------------------|------|
| 1.1            | 2 bits | Trip Group 1                           | 988  |
| 1.3            | 2 bits | Trip Group 2 - Proprietary             | 989  |
| 2              | 1 byte | Service Component Identification       | 1584 |
| 3.1            | 2 bits | Engine Build Hours Reset               | 1211 |
| 3.3            | 2 bits | Steering Straight Ahead Position Reset | 3600 |

**PGN 57344 Cab Message 1****CM1**

Message containing parameters originating from the vehicle cab.

Transmission Repetition Rate: 1 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 224  
PDU Specific: DA PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 57344 (0x00E000)

| Start Position | Length  | Parameter Name                                        | SPN  |
|----------------|---------|-------------------------------------------------------|------|
| 1              | 1 byte  | Requested Percent Fan Speed                           | 986  |
| 2-3            | 2 bytes | Cab Interior Temperature Command                      | 1691 |
| 4.1            | 2 bits  | Auxiliary Heater Coolant Pump Request                 | 1684 |
| 4.3            | 2 bits  | Battery Main Switch Hold Request                      | 1682 |
| 4.5            | 2 bits  | Operator Seat Direction Switch                        | 1714 |
| 4.7            | 2 bits  | Seat Belt Switch                                      | 1856 |
| 5.3            | 2 bits  | Vehicle Limiting Speed Governor Decrement Switch      | 1655 |
| 5.5            | 2 bits  | Vehicle Limiting Speed Governor Increment Switch      | 1654 |
| 5.7            | 2 bits  | Vehicle Limiting Speed Governor Enable Switch         | 1653 |
| 6.1            | 2 bits  | Diesel Particulate Filter Regeneration Inhibit Switch | 3695 |
| 6.3            | 2 bits  | Diesel Particulate Filter Regeneration Force Switch   | 3696 |
| 6.5            | 2 bits  | Automatic Gear Shifting Enable Switch                 | 1666 |
| 6.7            | 2 bits  | Engine Automatic Start Enable Switch                  | 1656 |
| 7.1            | 4 bits  | Auxiliary Heater Mode Request                         | 1683 |
| 7.5            | 2 bits  | Request Engine Zone Heating                           | 1685 |
| 7.7            | 2 bits  | Request Cab Zone Heating                              | 1686 |
| 8              | 1 byte  | Selected Maximum Vehicle Speed Limit                  | 2596 |

**PGN 61440****Electronic Retarder Controller 1****ERC1**

NOTE- This message will be transmitted by several types of retarding devices such as engine compression release brakes, exhaust system restriction brakes, and driveline retarders using hydraulic, electric, or mechanical friction to slow the vehicle. The source address of the message will indicate which one, and the type and location of the retarder are available in the Retarder Configuration Message (see PGN 65249) if that detail is important to the receiver.

Users should also be aware that the Shift Assist and Brake Assist switch status in the first byte of this message are to be used by other ECUs that might request retarding force from the retarder to know when such assistance is available. The state of the "switches" will NOT prevent the retarder from activating if requested, but should be honored by the requester (by not sending a request when the appropriate "switch" is not enabled) to prevent unwarranted noise.

Transmission Repetition Rate: 100 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 240  
PDU Specific: 0 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 61440 (0x00F000)

| Start Position | Length | Parameter Name                                            | SPN  |
|----------------|--------|-----------------------------------------------------------|------|
| 1.1            | 4 bits | Retarder Torque Mode                                      | 900  |
| 1.5            | 2 bits | Retarder Enable - Brake Assist Switch                     | 571  |
| 1.7            | 2 bits | Retarder Enable - Shift Assist Switch                     | 572  |
| 2              | 1 byte | Actual Retarder - Percent Torque                          | 520  |
| 3              | 1 byte | Intended Retarder Percent Torque                          | 1085 |
| 4.1            | 2 bits | Engine Coolant Load Increase                              | 1082 |
| 4.3            | 2 bits | Retarder Requesting Brake Light                           | 1667 |
| 4.5            | 2 bits | Retarder Road Speed Limit Switch                          | 4233 |
| 4.7            | 2 bits | Retarder Road Speed Exceeded Status                       | 4234 |
| 5              | 1 byte | Source Address of Controlling Device for Retarder Control | 1480 |
| 6              | 1 byte | Drivers Demand Retarder - Percent Torque                  | 1715 |
| 7              | 1 byte | Retarder Selection, non-engine                            | 1716 |
| 8              | 1 byte | Actual Maximum Available Retarder - Percent Torque        | 1717 |

**PGN 61441      Electronic Brake Controller 1****EBC1**

Used for brake control information

Transmission Repetition Rate: 100 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 240  
 PDU Specific: 1      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 61441 (0x00F001)

| Start Position | Length | Parameter Name                                         | SPN  |
|----------------|--------|--------------------------------------------------------|------|
| 1.1            | 2 bits | ASR Engine Control Active                              | 561  |
| 1.3            | 2 bits | ASR Brake Control Active                               | 562  |
| 1.5            | 2 bits | Anti-Lock Braking (ABS) Active                         | 563  |
| 1.7            | 2 bits | EBS Brake Switch                                       | 1121 |
| 2              | 1 byte | Brake Pedal Position                                   | 521  |
| 3.1            | 2 bits | ABS Off-road Switch                                    | 575  |
| 3.3            | 2 bits | ASR Off-road Switch                                    | 576  |
| 3.5            | 2 bits | ASR "Hill Holder" Switch                               | 577  |
| 3.7            | 2 bits | Traction Control Override Switch                       | 1238 |
| 4.1            | 2 bits | Accelerator Interlock Switch                           | 972  |
| 4.3            | 2 bits | Engine Derate Switch                                   | 971  |
| 4.5            | 2 bits | Engine Auxiliary Shutdown Switch                       | 970  |
| 4.7            | 2 bits | Remote Accelerator Enable Switch                       | 969  |
| 5              | 1 byte | Engine Retarder Selection                              | 973  |
| 6.1            | 2 bits | ABS Fully Operational                                  | 1243 |
| 6.3            | 2 bits | EBS Red Warning Signal                                 | 1439 |
| 6.5            | 2 bits | ABS/EBS Amber Warning Signal (Powered Vehicle)         | 1438 |
| 6.7            | 2 bits | ATC/ASR Information Signal                             | 1793 |
| 7              | 1 byte | Source Address of Controlling Device for Brake Control | 1481 |
| 8.3            | 2 bits | Halt brake switch                                      | 2911 |
| 8.5            | 2 bits | Trailer ABS Status                                     | 1836 |
| 8.7            | 2 bits | Tractor-Mounted Trailer ABS Warning Signal             | 1792 |

**PGN 61442      Electronic Transmission Controller 1****ETC1**

Transmission Repetition Rate: 10 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 240  
 PDU Specific: 2      PGN Supporting Information:  
 Default Priority: 3  
 Parameter Group Number: 61442 (0x00F002)

| Start Position | Length  | Parameter Name                                             | SPN  |
|----------------|---------|------------------------------------------------------------|------|
| 1.1            | 2 bits  | Transmission Driveline Engaged                             | 560  |
| 1.3            | 2 bits  | Transmission Torque Converter Lockup Engaged               | 573  |
| 1.5            | 2 bits  | Transmission Shift In Process                              | 574  |
| 1.7            | 2 bits  | Transmission Torque Converter Lockup Transition in Process | 4816 |
| 2-3            | 2 bytes | Transmission Output Shaft Speed                            | 191  |
| 4              | 1 byte  | Percent Clutch Slip                                        | 522  |
| 5.1            | 2 bits  | Engine Momentary Overspeed Enable                          | 606  |
| 5.3            | 2 bits  | Progressive Shift Disable                                  | 607  |
| 5.5            | 2 bits  | Momentary Engine Maximum Power Enable                      | 5015 |
| 6-7            | 2 bytes | Transmission Input Shaft Speed                             | 161  |



8                      1 byte                      Source Address of Controlling Device for Transmission Control                      1482

**(R) PGN 61443      *Electronic Engine Controller 2***

**EEC2**

Identifies electronic engine control related parameters.

Transmission Repetition Rate:      50 msec (preferred) or Engine Speed Dependent (if required by application)  
 Data Length:      8  
 Extended Data Page:      0  
 Data Page:      0  
 PDU Format:      240  
 PDU Specific:      3                      PGN Supporting Information:  
 Default Priority:      3  
 Parameter Group Number:      61443 (0x00F003)

| Start Position | Length | Parameter Name                                   | SPN  |
|----------------|--------|--------------------------------------------------|------|
| 1.1            | 2 bits | Accelerator Pedal 1 Low Idle Switch              | 558  |
| 1.3            | 2 bits | Accelerator Pedal Kickdown Switch                | 559  |
| 1.5            | 2 bits | Road Speed Limit Status                          | 1437 |
| 1.7            | 2 bits | Accelerator Pedal 2 Low Idle Switch              | 2970 |
| 2              | 1 byte | Accelerator Pedal Position 1                     | 91   |
| 3              | 1 byte | Engine Percent Load At Current Speed             | 92   |
| 4              | 1 byte | Remote Accelerator Pedal Position                | 974  |
| 5              | 1 byte | Accelerator Pedal Position 2                     | 29   |
| 6.1            | 2 bits | Vehicle Acceleration Rate Limit Status           | 2979 |
| 6.3            | 2 bits | Momentary Engine Maximum Power Enable Feedback   | 5021 |
| 6.5            | 2 bits | DPF Thermal Management Active                    | 5399 |
| 6.7            | 2 bits | SCR Thermal Management Active                    | 5400 |
| 7              | 1 byte | Actual Maximum Available Engine - Percent Torque | 3357 |
| 8              | 1 byte | Estimated Pumping - Percent Torque               | 5398 |

**PGN 61444      *Electronic Engine Controller 1***

**EEC1**

Engine related parameters

Transmission Repetition Rate:      engine speed dependent  
 Data Length:      8  
 Extended Data Page:      0  
 Data Page:      0  
 PDU Format:      240  
 PDU Specific:      4                      PGN Supporting Information:  
 Default Priority:      3  
 Parameter Group Number:      61444 (0x00F004)

| Start Position | Length  | Parameter Name                                          | SPN  |
|----------------|---------|---------------------------------------------------------|------|
| 1.1            | 4 bits  | Engine Torque Mode                                      | 899  |
| 1.5            | 4 bits  | Actual Engine - Percent Torque High Resolution          | 4154 |
| 2              | 1 byte  | Driver's Demand Engine - Percent Torque                 | 512  |
| 3              | 1 byte  | Actual Engine - Percent Torque                          | 513  |
| 4-5            | 2 bytes | Engine Speed                                            | 190  |
| 6              | 1 byte  | Source Address of Controlling Device for Engine Control | 1483 |
| 7.1            | 4 bits  | Engine Starter Mode                                     | 1675 |
| 8              | 1 byte  | Engine Demand – Percent Torque                          | 2432 |

**PGN 61445****Electronic Transmission Controller 2****ETC2**

Transmission Repetition Rate: 100 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 240  
PDU Specific: 5 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 61445 (0x00F005)

| Start Position | Length  | Parameter Name                 | SPN |
|----------------|---------|--------------------------------|-----|
| 1              | 1 byte  | Transmission Selected Gear     | 524 |
| 2-3            | 2 bytes | Transmission Actual Gear Ratio | 526 |
| 4              | 1 byte  | Transmission Current Gear      | 523 |
| 5-6            | 2 bytes | Transmission Requested Range   | 162 |
| 7-8            | 2 bytes | Transmission Current Range     | 163 |

**PGN 61446****Electronic Axle Controller 1****EAC1**

NOTE - Request has to be responded to with as many messages as necessary to transmit all available information.

Transmission Repetition Rate: 500 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 240  
PDU Specific: 6 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 61446 (0x00F006)

| Start Position | Length | Parameter Name                          | SPN  |
|----------------|--------|-----------------------------------------|------|
| 1              | 8 bits | Location                                | 927  |
| 2.1            | 2 bits | Differential Lock State - Front Axle 1  | 567  |
| 2.3            | 2 bits | Differential Lock State - Front Axle 2  | 568  |
| 2.5            | 2 bits | Differential Lock State - Rear Axle 1   | 569  |
| 2.7            | 2 bits | Differential Lock State - Rear Axle 2   | 570  |
| 3.1            | 2 bits | Differential Lock State - Central       | 564  |
| 3.3            | 2 bits | Differential Lock State - Central Front | 565  |
| 3.5            | 2 bits | Differential Lock State - Central Rear  | 566  |
| 4.1            | 2 bits | Front axle group engagement status      | 3819 |
| 4.3            | 2 bits | Rear axle group engagement status       | 3820 |

**PGN 61447 Forward Lane Image urgent msg****FLI1**

Transmission Repetition Rate: 50 ms (only when active)  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 240  
PDU Specific: 7 PGN Supporting Information:  
Default Priority: 4  
Parameter Group Number: 61447 (0x00F007)

| Start Position | Length | Parameter Name                      | SPN  |
|----------------|--------|-------------------------------------|------|
| 1.1            | 2 bits | Lane Departure Left                 | 3565 |
| 1.3            | 2 bits | Lane Departure Right                | 3566 |
| 1.5            | 2 bits | Lane Departure Imminent, Right Side | 1701 |
| 1.7            | 2 bits | Lane Departure Imminent, Left Side  | 1700 |

**PGN 61448 Hydraulic Pressure Governor Info****HPG**

Information to be used for a hydraulic pressure governing control system

Transmission Repetition Rate: 50 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 240  
PDU Specific: 8 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 61448 (0x00F008)

| Start Position | Length  | Parameter Name                                    | SPN  |
|----------------|---------|---------------------------------------------------|------|
| 1-2            | 2 bytes | Hydraulic Pressure                                | 1762 |
| 3.1            | 2 bits  | Engine Hydraulic Pressure Governor Mode Indicator | 1763 |
| 3.3            | 2 bits  | Engine Hydraulic Pressure Governor Switch         | 1764 |
| 3.5            | 2 bits  | Fire Apparatus Pump Engagement                    | 2599 |

**PGN 61449 Vehicle Dynamic Stability Control 2****VDC2**

Contains information which relates to the vehicle's movement.

Transmission Repetition Rate: 10 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 240  
PDU Specific: 9 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 61449 (0x00F009)

| Start Position | Length  | Parameter Name                   | SPN  |
|----------------|---------|----------------------------------|------|
| 1-2            | 2 bytes | Steering Wheel Angle             | 1807 |
| 3.1            | 6 bits  | Steering Wheel Turn Counter      | 1811 |
| 3.7            | 2 bits  | Steering Wheel Angle Sensor Type | 1812 |
| 4-5            | 2 bytes | Yaw Rate                         | 1808 |
| 6-7            | 2 bytes | Lateral Acceleration             | 1809 |
| 8              | 1 byte  | Longitudinal Acceleration        | 1810 |

**(R) PGN 61450 Engine Gas Flow Rate****EGF1**

Flow rates of Air and mixed gasses into the engine cylinders.

Transmission Repetition Rate: 50 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 240  
 PDU Specific: 10 PGN Supporting Information:  
 Default Priority: 3  
 Parameter Group Number: 61450 (0x00F00A)

| Start Position | Length  | Parameter Name                                           | SPN  |
|----------------|---------|----------------------------------------------------------|------|
| 1-2            | 2 bytes | Engine Exhaust Gas Recirculation 1 (EGR1) Mass Flow Rate | 2659 |
| 3-4            | 2 bytes | Engine Intake Air Mass Flow Rate                         | 132  |
| 5-6            | 2 bytes | Engine Exhaust Gas Recirculation 2 (EGR2) Mass Flow Rate | 5257 |

**PGN 61451 Electronic Steering Control****ESC1**

PGN which indicates the actual angle and the status of a steerable axle

Transmission Repetition Rate: 20 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 240  
 PDU Specific: 11 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 61451 (0x00F00B)

| Start Position | Length  | Parameter Name                       | SPN  |
|----------------|---------|--------------------------------------|------|
| 1-2            | 2 bytes | Actual Inner wheel steering angle    | 2927 |
| 3              | 8 bits  | Axle Location                        | 2928 |
| 4.1            | 4 bits  | Status of Steering Axle              | 2923 |
| 4.5            | 2 bits  | Steerable Lift Axle Lowering Inhibit | 2922 |
| 5.1            | 4 bits  | Steering Type                        | 2924 |
| 5.5            | 4 bits  | Type of Steering Forces              | 2925 |
| 6.1            | 4 bits  | Type of Steering Transmission        | 2926 |

**PGN 61452 Electronic Transmission Controller #8****ETC8**

Electronic Transmission Controller #8

Transmission Repetition Rate: 20 ms when torque converter unlocked, 100 ms when torque converter locked  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 240  
 PDU Specific: 12 PGN Supporting Information:  
 Default Priority: 3  
 Parameter Group Number: 61452 (0x00F00C)

| Start Position | Length  | Parameter Name                            | SPN  |
|----------------|---------|-------------------------------------------|------|
| 1-2            | 2 bytes | Transmission Torque Converter Ratio       | 3030 |
| 3-4            | 2 bytes | Transmission Clutch/Converter Input Speed | 5052 |

**(R) PGN 61453 Land Leveling System Operational Information****LOI**

Group of operational parameters associated with the Land Leveling System, such as switch states. This is provided to the device controlling the blade, and is usually directed at the primary land leveling controller.

**Notes:**

1. The parameter group is filled with SPNs sent to the Land Leveling System controller. Similar PGNs exist, 65138 for example, but PGN 65138 is sent out by the Land Leveling System primary controller to reflect the mode the land leveling system has been put into (auto, manual). This logical decision to put the system into auto/manual mode is based in part on the input from this PGN, along with other various inputs. It makes more sense to create this PGN filled with parameters sourced from the non-primary controller, rather than use the PGN sourced by the primary controller itself. In the future, other SPNs coming from the non-primary controller can be added to the PGN. There are plans to add more switch values in the future.
2. Other systems with automated blade controls should be able to use this parameter group, since it contains measured switch values.

Transmission Repetition Rate: 100 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 240  
 PDU Specific: 13 PGN Supporting Information:  
 Default Priority: 3  
 Parameter Group Number: 61453 (0x00F00D)

| Start Position | Length | Parameter Name                                   | SPN  |
|----------------|--------|--------------------------------------------------|------|
| 1.1            | 4 bits | Blade Control Mode Switch                        | 3156 |
| 1.5            | 4 bits | Desired Grade Offset Switch                      | 3157 |
| 2.1            | 4 bits | Blade Auto Mode Command                          | 3158 |
| 2.5            | 4 bits | Left Blade Control Mode Operator Control         | 3334 |
| 3.1            | 4 bits | Right Blade Control Mode Operator Control        | 3335 |
| 3.5            | 4 bits | Left Desired Blade Offset Operator Control       | 3336 |
| 4.1            | 4 bits | Right Desired Blade Offset Operator Control      | 3337 |
| 4.5            | 4 bits | Side-shift Blade Control Mode Operator Control   | 3338 |
| 5.1            | 4 bits | Side-shift Desired Blade Offset Operator Control | 3339 |
| 5.5            | 2 bits | Set Elevation Sensor #1 Reference Elevation      | 5405 |
| 5.7            | 2 bits | Set Elevation Sensor #2 Reference Elevation      | 5406 |

**PGN 61454      Aftertreatment 1 Intake Gas 1****AT1IG1**

The purpose of this PGN is to group the aftertreatment intake sensor data for bank 1. These values include the NOx, %O2, Status's of the sensors with respect to the power being supplied and the heating element, errors and stability of the readings.

Transmission Repetition Rate: 50 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 240  
 PDU Specific: 14      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 61454 (0x00F00E)

| Start Position | Length  | Parameter Name                                            | SPN  |
|----------------|---------|-----------------------------------------------------------|------|
| 1-2            | 2 bytes | Aftertreatment 1 Intake NOx                               | 3216 |
| 3-4            | 2 bytes | Aftertreatment 1 Intake O2                                | 3217 |
| 5.1            | 2 bits  | Aftertreatment 1 Intake Gas Sensor Power Status           | 3218 |
| 5.3            | 2 bits  | Aftertreatment 1 Intake Gas Sensor at Temperature         | 3219 |
| 5.5            | 2 bits  | Aftertreatment 1 Intake NOx Reading Stable                | 3220 |
| 5.7            | 2 bits  | Aftertreatment 1 Intake Wide-Range % O2 Reading Stable    | 3221 |
| 6.1            | 5 bits  | Aftertreatment 1 Intake Gas Sensor Heater Preliminary FMI | 3222 |
| 6.6            | 2 bits  | Aftertreatment 1 Intake Gas Sensor Heater Control         | 3223 |
| 7.1            | 5 bits  | Aftertreatment 1 Intake NOx Sensor Preliminary FMI        | 3224 |
| 8.1            | 5 bits  | Aftertreatment 1 Intake Oxygen Sensor Preliminary FMI     | 3225 |

**PGN 61455      Aftertreatment 1 Outlet Gas 1****AT1OG1**

The purpose of this PGN is to group the aftertreatment outlet sensor data for bank 1. These values include the NOx, %O2, Status's of the sensors with respect to the power being supplied and the heating element, errors and stability of the readings.

Transmission Repetition Rate: 50 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 240  
 PDU Specific: 15      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 61455 (0x00F00F)

| Start Position | Length  | Parameter Name                                            | SPN  |
|----------------|---------|-----------------------------------------------------------|------|
| 1-2            | 2 bytes | Aftertreatment 1 Outlet NOx                               | 3226 |
| 3-4            | 2 bytes | Aftertreatment 1 Outlet O2                                | 3227 |
| 5.1            | 2 bits  | Aftertreatment 1 Outlet Gas Sensor Power Status           | 3228 |
| 5.3            | 2 bits  | Aftertreatment 1 Outlet Gas Sensor at Temperature         | 3229 |
| 5.5            | 2 bits  | Aftertreatment 1 Outlet NOx Reading Stable                | 3230 |
| 5.7            | 2 bits  | Aftertreatment 1 Outlet Wide-Range %O2 Reading Stable     | 3231 |
| 6.1            | 5 bits  | Aftertreatment 1 Outlet Gas Sensor Heater Preliminary FMI | 3232 |
| 6.6            | 2 bits  | Aftertreatment 1 Outlet Gas Sensor Heater Control         | 3233 |
| 7.1            | 5 bits  | Aftertreatment 1 Outlet NOx Sensor Preliminary FMI        | 3234 |
| 8.1            | 5 bits  | Aftertreatment 1 Outlet Oxygen Sensor Preliminary FMI     | 3235 |

**PGN 61456      Aftertreatment 2 Intake Gas 1****AT2IG1**

The purpose of this PGN is to group the aftertreatment intake sensor data for bank 2. These values include the NOx, %O2, status of the sensors with respect to the power being supplied and the heating element, errors and stability of the readings.

Transmission Repetition Rate: 50 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 240  
 PDU Specific: 16      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 61456 (0x00F010)

| Start Position | Length  | Parameter Name                                            | SPN  |
|----------------|---------|-----------------------------------------------------------|------|
| 1-2            | 2 bytes | Aftertreatment 2 Intake NOx                               | 3255 |
| 3-4            | 2 bytes | Aftertreatment 2 Intake O2                                | 3256 |
| 5.1            | 2 bits  | Aftertreatment 2 Intake Gas Sensor Power Status           | 3257 |
| 5.3            | 2 bits  | Aftertreatment 2 Intake Gas Sensor at Temperature         | 3258 |
| 5.5            | 2 bits  | Aftertreatment 2 Intake NOx Reading Stable                | 3259 |
| 5.7            | 2 bits  | Aftertreatment 2 Intake Wide-Range % O2 Reading Stable    | 3260 |
| 6.1            | 5 bits  | Aftertreatment 2 Intake Gas Sensor Heater Preliminary FMI | 3261 |
| 6.6            | 2 bits  | Aftertreatment 2 Intake Gas Sensor Heater Control         | 3262 |
| 7.1            | 5 bits  | Aftertreatment 2 Intake NOx Sensor Preliminary FMI        | 3263 |
| 8.1            | 5 bits  | Aftertreatment 2 Intake Oxygen Sensor Preliminary FMI     | 3264 |

**PGN 61457      Aftertreatment 2 Outlet Gas 1****AT2OG1**

The purpose of this PGN is to group the aftertreatment outlet sensor data for bank 2. These values include the NOx, %O2, status of the sensors with respect to the power being supplied and the heating element, errors and stability of the readings.

Transmission Repetition Rate: 50 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 240  
 PDU Specific: 17      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 61457 (0x00F011)

| Start Position | Length  | Parameter Name                                            | SPN  |
|----------------|---------|-----------------------------------------------------------|------|
| 1-2            | 2 bytes | Aftertreatment 2 Outlet NOx                               | 3265 |
| 3-4            | 2 bytes | Aftertreatment 2 Outlet O2                                | 3266 |
| 5.1            | 2 bits  | Aftertreatment 2 Outlet Gas Sensor Power Status           | 3267 |
| 5.3            | 2 bits  | Aftertreatment 2 Outlet Gas Sensor at Temperature         | 3268 |
| 5.5            | 2 bits  | Aftertreatment 2 Outlet NOx Reading Stable                | 3269 |
| 5.7            | 2 bits  | Aftertreatment 2 Outlet Wide-Range % O2 Reading Stable    | 3270 |
| 6.1            | 5 bits  | Aftertreatment 2 Outlet Gas Sensor Heater Preliminary FMI | 3271 |
| 6.6            | 2 bits  | Aftertreatment 2 Outlet Gas Sensor Heater Control         | 3272 |
| 7.1            | 5 bits  | Aftertreatment 2 Outlet NOx Sensor Preliminary FMI        | 3273 |
| 8.1            | 5 bits  | Aftertreatment 2 Outlet Oxygen Sensor Preliminary FMI     | 3274 |

**(R) PGN 61458 Fifth Wheel Smart Systems 1****FWSS1**

Fifth wheel smart system information. Parameters used to determine the status of the tractor to trailer coupling system integrity.

Transmission Repetition Rate: 50 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 240  
 PDU Specific: 18 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 61458 (0x00F012)

| Start Position | Length  | Parameter Name                     | SPN  |
|----------------|---------|------------------------------------|------|
| 1-2            | 2 bytes | Fifth Wheel Vertical Force         | 3308 |
| 3-4            | 2 bytes | Fifth Wheel Drawbar Force          | 3309 |
| 5-6            | 2 bytes | Fifth Wheel Roll Moment            | 3310 |
| 7.1            | 2 bits  | Fifth Wheel Roll Warning Indicator | 3317 |

**PGN 61459 Slope Sensor Information****SSI**

The Slope Sensor Information message shall provide a measurement of the vehicles pitch angle, a measurement of the vehicles roll angle, and a measurement of the vehicles pitch rate around the y-axis.

Vehicle axis system defined in SAE J670e, Vehicle Dynamics Terminology.

8.4.7 Vehicle Roll Angle – The angle between the vehicle y-axis and the ground plane.

8.4.9 Vehicle Pitch Angle – The angle between the vehicle x-axis and the ground plane.

Note 6

"Angular rotations are positive clockwise when looking in the positive direction of the axis about which rotation occurs."

The data within the message shall contain the measured pitch, roll, and pitch rate, figure of merits for the three measurements, a compensated measurement indicator, and measurement latency for the sensor measurements.

Note 1) When this PGN is used to transmit information from a device not attached to the vehicle, the components local frame of reference shall be used.

Note 2) The NAME of the source of the PGN shall be used to associate to the frame of reference. (e.g, Machine control will report vehicle pitch and roll, blade control will report blade pitch and roll).

Transmission Repetition Rate: 10 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 240  
 PDU Specific: 19 PGN Supporting Information: See Appendix D - PGN 61459  
 Default Priority: 3  
 Parameter Group Number: 61459 (0x00F013)

| Start Position | Length  | Parameter Name                     | SPN  |
|----------------|---------|------------------------------------|------|
| 1-2            | 2 bytes | Pitch Angle                        | 3318 |
| 3-4            | 2 bytes | Roll Angle                         | 3319 |
| 5-6            | 2 bytes | Pitch Rate                         | 3322 |
| 7.1            | 2 bits  | Pitch Angle Figure of Merit        | 3323 |
| 7.3            | 2 bits  | Roll Angle Figure of Merit         | 3324 |
| 7.5            | 2 bits  | Pitch Rate Figure of Merit         | 3325 |
| 7.7            | 2 bits  | Pitch and Roll Compensated         | 3326 |
| 8              | 1 byte  | Roll and Pitch Measurement Latency | 3327 |



**PGN 61460 Blade Information****BI**

A measurement of the machine's relative blade height and a rotational angle measurement of the machine blade yaw angle around the machine z-axis as defined in SAE J670e, Vehicle Dynamics Terminology.

The Relative Blade Height is defined to be the relative vertical distance from a fixed location on the machine blade to a reference. The reference might be, for example, the ground or a stringline.

The data in the message is intended to be accurate enough for real-time control.

SAE J670e, Note 6

"Angular rotations are positive clockwise when looking in the positive direction of the axis about which rotation occurs."

The Blade Rotation Angle is defined to be the angle from the null position on the machine. The null position is orthogonal from the z-axis along the x-axis.

The data within the message shall contain the measured Relative Blade Height, the measured Blade Rotation Angle, a figure of merit for the Relative Blade Height, a figure of merit for the Blade Rotation Angle, and an estimated measurement latency.

|                               |                  |                             |
|-------------------------------|------------------|-----------------------------|
| Transmission Repetition Rate: | 50 ms            |                             |
| Data Length:                  | 8                |                             |
| Extended Data Page:           | 0                |                             |
| Data Page:                    | 0                |                             |
| PDU Format:                   | 240              |                             |
| PDU Specific:                 | 20               | PGN Supporting Information: |
| Default Priority:             | 3                |                             |
| Parameter Group Number:       | 61460 (0x00F014) |                             |

| Start Position | Length  | Parameter Name                                                     | SPN  |
|----------------|---------|--------------------------------------------------------------------|------|
| 1-2            | 2 bytes | Relative Blade Height                                              | 3365 |
| 3-4            | 2 bytes | Blade Rotation Angle                                               | 3331 |
| 5              | 1 byte  | Relative Blade Height and Blade Rotation Angle Measurement Latency | 3366 |
| 6.1            | 2 bits  | Relative Blade Height Figure of Merit                              | 3367 |
| 6.3            | 2 bits  | Blade Rotation Angle Figure of Merit                               | 3332 |

**PGN 61462      Cylinder Combustion Status****CCS**

Used to send the SPNs containing information relating to the state of combustion for 24 cylinders. When there is no combustion detected on any one cylinder, this PGN needs to be sent every crank revolution (engine speed dependant). If combustion is good on all cylinders, 5 seconds would be satisfactory for a transmission rate. This will allow communication between a separate module monitoring combustion inside the engine cylinders and the control module that needs this information to make engine related decisions.

Transmission Repetition Rate: Engine speed dependent when there is no combustion, once every 5 seconds otherwise

Data Length: 8

Extended Data Page: 0

Data Page: 0

PDU Format: 240

PDU Specific: 22      PGN Supporting Information:

Default Priority: 3

Parameter Group Number: 61462 (0x00F016)

| Start Position | Length | Parameter Name                       | SPN  |
|----------------|--------|--------------------------------------|------|
| 1.1            | 2 bits | Engine Cylinder 1 Combustion Status  | 3387 |
| 1.3            | 2 bits | Engine Cylinder 2 Combustion Status  | 3388 |
| 1.5            | 2 bits | Engine Cylinder 3 Combustion Status  | 3389 |
| 1.7            | 2 bits | Engine Cylinder 4 Combustion Status  | 3390 |
| 2.1            | 2 bits | Engine Cylinder 5 Combustion Status  | 3391 |
| 2.3            | 2 bits | Engine Cylinder 6 Combustion Status  | 3392 |
| 2.5            | 2 bits | Engine Cylinder 7 Combustion Status  | 3393 |
| 2.7            | 2 bits | Engine Cylinder 8 Combustion Status  | 3394 |
| 3.1            | 2 bits | Engine Cylinder 9 Combustion Status  | 3395 |
| 3.3            | 2 bits | Engine Cylinder 10 Combustion Status | 3396 |
| 3.5            | 2 bits | Engine Cylinder 11 Combustion Status | 3397 |
| 3.7            | 2 bits | Engine Cylinder 12 Combustion Status | 3398 |
| 4.1            | 2 bits | Engine Cylinder 13 Combustion Status | 3399 |
| 4.3            | 2 bits | Engine Cylinder 14 Combustion Status | 3400 |
| 4.5            | 2 bits | Engine Cylinder 15 Combustion Status | 3401 |
| 4.7            | 2 bits | Engine Cylinder 16 Combustion Status | 3402 |
| 5.1            | 2 bits | Engine Cylinder 17 Combustion Status | 3403 |
| 5.3            | 2 bits | Engine Cylinder 18 Combustion Status | 3404 |
| 5.5            | 2 bits | Engine Cylinder 19 Combustion Status | 3405 |
| 5.7            | 2 bits | Engine Cylinder 20 Combustion Status | 3406 |
| 6.1            | 2 bits | Engine Cylinder 21 Combustion Status | 3407 |
| 6.3            | 2 bits | Engine Cylinder 22 Combustion Status | 3408 |
| 6.5            | 2 bits | Engine Cylinder 23 Combustion Status | 3409 |
| 6.7            | 2 bits | Engine Cylinder 24 Combustion Status | 3410 |

**PGN 61463 Engine Knock Level #1****KL1**

Used to send the SPNs containing information relating to the level of knock for 8 cylinders. When knock is detected on any one cylinder, this PGN needs to be sent every crank revolution (engine speed dependant). If there is no knock detected on any cylinder, 5 seconds would be satisfactory for a transmission rate. This will allow communication between a separate module monitoring combustion inside the engine cylinders and the control module that needs this information to make engine related decisions.

Transmission Repetition Rate: Engine speed dependent when knock present, once every 5 seconds otherwise  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 240  
PDU Specific: 23 PGN Supporting Information:  
Default Priority: 3  
Parameter Group Number: 61463 (0x00F017)

| Start Position | Length | Parameter Name                | SPN  |
|----------------|--------|-------------------------------|------|
| 1              | 1 byte | Engine Cylinder 1 Knock Level | 1352 |
| 2              | 1 byte | Engine Cylinder 2 Knock Level | 1353 |
| 3              | 1 byte | Engine Cylinder 3 Knock Level | 1354 |
| 4              | 1 byte | Engine Cylinder 4 Knock Level | 1355 |
| 5              | 1 byte | Engine Cylinder 5 Knock Level | 1356 |
| 6              | 1 byte | Engine Cylinder 6 Knock Level | 1357 |
| 7              | 1 byte | Engine Cylinder 7 Knock Level | 1358 |
| 8              | 1 byte | Engine Cylinder 8 Knock Level | 1359 |

**PGN 61464 Engine Knock Level #2****KL2**

Used to send the SPNs containing information relating to the level of knock for 8 cylinders. When knock is detected on any one cylinder, this PGN needs to be sent every crank revolution (engine speed dependant). If there is no knock detected on any cylinder, 5 seconds would be satisfactory for a transmission rate. This will allow communication between a separate module monitoring combustion inside the engine cylinders and the control module that needs this information to make engine related decisions.

Transmission Repetition Rate: Engine speed dependent when knock present, once every 5 seconds otherwise  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 240  
PDU Specific: 24 PGN Supporting Information:  
Default Priority: 3  
Parameter Group Number: 61464 (0x00F018)

| Start Position | Length | Parameter Name                 | SPN  |
|----------------|--------|--------------------------------|------|
| 1              | 1 byte | Engine Cylinder 9 Knock Level  | 1360 |
| 2              | 1 byte | Engine Cylinder 10 Knock Level | 1361 |
| 3              | 1 byte | Engine Cylinder 11 Knock Level | 1362 |
| 4              | 1 byte | Engine Cylinder 12 Knock Level | 1363 |
| 5              | 1 byte | Engine Cylinder 13 Knock Level | 1364 |
| 6              | 1 byte | Engine Cylinder 14 Knock Level | 1365 |
| 7              | 1 byte | Engine Cylinder 15 Knock Level | 1366 |
| 8              | 1 byte | Engine Cylinder 16 Knock Level | 1367 |

**PGN 61465 Engine Knock Level #3****KL3**

Used to send the SPNs containing information relating to the level of knock for 8 cylinders. When knock is detected on any one cylinder, this PGN needs to be sent every crank revolution (engine speed dependant). If there is no knock detected on any cylinder, 5 seconds would be satisfactory for a transmission rate. This will allow communication between a separate module monitoring combustion inside the engine cylinders and the control module that needs this information to make engine related decisions.

Transmission Repetition Rate: Engine speed dependent when knock present, once every 5 seconds otherwise  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 240  
 PDU Specific: 25 PGN Supporting Information:  
 Default Priority: 3  
 Parameter Group Number: 61465 (0x00F019)

| Start Position | Length | Parameter Name                 | SPN  |
|----------------|--------|--------------------------------|------|
| 1              | 1 byte | Engine Cylinder 17 Knock Level | 1368 |
| 2              | 1 byte | Engine Cylinder 18 Knock Level | 1369 |
| 3              | 1 byte | Engine Cylinder 19 Knock Level | 1370 |
| 4              | 1 byte | Engine Cylinder 20 Knock Level | 1371 |
| 5              | 1 byte | Engine Cylinder 21 Knock Level | 1372 |
| 6              | 1 byte | Engine Cylinder 22 Knock Level | 1373 |
| 7              | 1 byte | Engine Cylinder 23 Knock Level | 1374 |
| 8              | 1 byte | Engine Cylinder 24 Knock Level | 1375 |

**(R) PGN 61466 Engine Throttle / Fuel Actuator Control Command****TFAC**

Used to control networked electronic throttle control actuator and/or fuel control actuator valves. Otherwise, this PGN can be used to monitor commanded % positioning to electronic throttle control actuator and/or fuel control actuator valves.

Transmission Repetition Rate: 50 msec (preferred) or Engine Speed Dependent (if required by application)  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 240  
 PDU Specific: 26 PGN Supporting Information: See Appendix D - PGN 61466  
 Default Priority: 4  
 Parameter Group Number: 61466 (0x00F01A)

| Start Position | Length  | Parameter Name                             | SPN  |
|----------------|---------|--------------------------------------------|------|
| 1-2            | 2 bytes | Engine Throttle Actuator 1 Control Command | 3464 |
| 3-4            | 2 bytes | Engine Throttle Actuator 2 Control Command | 3465 |
| 5-6            | 2 bytes | Engine Fuel Actuator 1 Control Command     | 633  |
| 7-8            | 2 bytes | Engine Fuel Actuator 2 Control Command     | 1244 |

**PGN 61469      Steering Angle Sensor Information****SAS**

Contains information which relates to a steering angle sensor.

Transmission Repetition Rate: 10 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 240  
PDU Specific: 29      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 61469 (0x00F01D)

| Start Position | Length  | Parameter Name                          | SPN  |
|----------------|---------|-----------------------------------------|------|
| 1-2            | 2 bytes | Steering Wheel Angle                    | 3683 |
| 3.1            | 6 bits  | Steering Wheel Angle Range Counter      | 3684 |
| 3.7            | 2 bits  | Steering Wheel Angle Range Counter Type | 3685 |
| 5-6            | 2 bytes | Steering Wheel Angle Range              | 3686 |
| 7.1            | 2 bits  | Steering Angle Sensor Active Mode       | 3687 |
| 7.3            | 2 bits  | Steering Angle Sensor Calibrated        | 3688 |
| 8.1            | 4 bits  | Message Counter                         | 3689 |
| 8.5            | 4 bits  | Message Checksum                        | 3690 |

**PGN 61473      Engine Speed Sensor Information****ESSI**

This PGN contains the speed information and status signal of each engine speed sensor. This message is used for service to troubleshoot no-start or hard start problems. This message is not needed except for servicing.

Transmission Repetition Rate: Transmitted only after requested. After request, broadcast rate is engine speed dependent. Update stopped after key switch cycle.

Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 240  
PDU Specific: 33      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 61473 (0x00F021)

| Start Position | Length  | Parameter Name                              | SPN  |
|----------------|---------|---------------------------------------------|------|
| 1-2            | 2 bytes | Engine Speed 1                              | 4201 |
| 3-4            | 2 bytes | Engine Speed 2                              | 723  |
| 5-6            | 2 bytes | Engine Speed 3                              | 4202 |
| 7.3            | 2 bits  | Engine Speed Sensor 3 Timing Pattern Status | 4205 |
| 7.5            | 2 bits  | Engine Speed Sensor 2 Timing Pattern Status | 4204 |
| 7.7            | 2 bits  | Engine Speed Sensor 1 Timing Pattern Status | 4203 |

**(R) PGN 61475      Aftertreatment 1 SCR Dosing System Information 1****A1SCRDSI1**

This message contains SCR dosing system information for aftertreatment system 1 (or bank 1). See PGN 64833 for more information.

Transmission Repetition Rate: 50 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 240  
PDU Specific: 35                      PGN Supporting Information:  
Default Priority: 3  
Parameter Group Number: 61475 (0x00F023)

| Start Position | Length  | Parameter Name                                             | SPN  |
|----------------|---------|------------------------------------------------------------|------|
| 1-2            | 2 bytes | Aftertreatment 1 SCR Actual Dosing Reagent Quantity        | 4331 |
| 3.1            | 4 bits  | Aftertreatment 1 SCR System State                          | 4332 |
| 4-5            | 2 bytes | Aftertreatment 1 SCR Actual Reagent Quantity of Integrator | 4333 |
| 6              | 1 byte  | Aftertreatment 1 SCR Dosing Reagent Absolute Pressure      | 4334 |

**PGN 61476      Aftertreatment 1 SCR Dosing System Requests 1****A1SCRDSR1**

This message contains SCR dosing system request information for aftertreatment system 1 (or bank 1). See PGN 64832 for more information.

Transmission Repetition Rate: 50 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 240  
PDU Specific: 36                      PGN Supporting Information:  
Default Priority: 3  
Parameter Group Number: 61476 (0x00F024)

| Start Position | Length  | Parameter Name                                                 | SPN  |
|----------------|---------|----------------------------------------------------------------|------|
| 1-2            | 2 bytes | Aftertreatment 1 SCR Requested Dosing Reagent Quantity         | 4348 |
| 3.1            | 4 bits  | Aftertreatment 1 SCR System Requested State                    | 4349 |
| 4-5            | 2 bytes | Aftertreatment 1 SCR Requested Reagent Quantity for Integrator | 4350 |

**PGN 61477      Aftertreatment 1 SCR Ammonia Information****A1SCRAI**

This message contains aftertreatment outlet ammonia information for aftertreatment system 1 (or bank 1).

Transmission Repetition Rate: 50 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 240  
PDU Specific: 37      PGN Supporting Information:  
Default Priority: 3  
Parameter Group Number: 61477 (0x00F025)

| Start Position | Length  | Parameter Name                                                | SPN  |
|----------------|---------|---------------------------------------------------------------|------|
| 1-2            | 2 bytes | Aftertreatment 1 Outlet NH3                                   | 4377 |
| 3.1            | 5 bits  | Aftertreatment 1 Outlet NH3 Sensor Preliminary FMI            | 4378 |
| 4.1            | 2 bits  | Aftertreatment 1 Outlet NH3 Reading Stable                    | 4379 |
| 4.3            | 2 bits  | Aftertreatment 1 Outlet NH3 Gas Sensor Power In Range         | 4380 |
| 4.5            | 2 bits  | Aftertreatment 1 Outlet NH3 Gas Sensor at Temperature         | 4381 |
| 5.1            | 5 bits  | Aftertreatment 1 Outlet NH3 Gas Sensor Heater Preliminary FMI | 4382 |
| 6.1            | 2 bits  | Aftertreatment 1 Outlet NH3 Gas Sensor Heater Control         | 4383 |

**(R) PGN 61478      Aftertreatment 2 SCR Dosing System Information 1****A2SCRDSI1**

This message contains SCR dosing system information for aftertreatment system 2 (or bank 2). See PGN 64827 for more information.

Transmission Repetition Rate: 50 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 240  
PDU Specific: 38      PGN Supporting Information:  
Default Priority: 3  
Parameter Group Number: 61478 (0x00F026)

| Start Position | Length  | Parameter Name                                             | SPN  |
|----------------|---------|------------------------------------------------------------|------|
| 1-2            | 2 bytes | Aftertreatment 2 SCR Actual Dosing Reagent Quantity        | 4384 |
| 3.1            | 4 bits  | Aftertreatment 2 SCR System State                          | 4385 |
| 4-5            | 2 bytes | Aftertreatment 2 SCR Actual Reagent Quantity of Integrator | 4386 |
| 6              | 1 byte  | Aftertreatment 2 SCR Dosing Reagent Absolute Pressure      | 4387 |

**PGN 61479      Aftertreatment 2 SCR Dosing System Requests 1****A2SCRDSR1**

This message contains SCR dosing system request information for aftertreatment system 2 (or bank 2).

Transmission Repetition Rate: 50 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 240  
PDU Specific: 39      PGN Supporting Information:  
Default Priority: 3  
Parameter Group Number: 61479 (0x00F027)

| Start Position | Length  | Parameter Name                                                 | SPN  |
|----------------|---------|----------------------------------------------------------------|------|
| 1-2            | 2 bytes | Aftertreatment 2 SCR Requested Dosing Reagent Quantity         | 4401 |
| 3.1            | 4 bits  | Aftertreatment 2 SCR System Requested State                    | 4402 |
| 4-5            | 2 bytes | Aftertreatment 2 SCR Requested Reagent Quantity for Integrator | 4403 |

**PGN 61480      Aftertreatment 2 SCR Ammonia Information****A2SCRAI**

This message contains outlet ammonia information for aftertreatment system 2 (or bank 2).

Transmission Repetition Rate: 50 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 240  
PDU Specific: 40      PGN Supporting Information:  
Default Priority: 3  
Parameter Group Number: 61480 (0x00F028)

| Start Position | Length  | Parameter Name                                                | SPN  |
|----------------|---------|---------------------------------------------------------------|------|
| 1-2            | 2 bytes | Aftertreatment 2 Outlet NH3                                   | 4443 |
| 3.1            | 5 bits  | Aftertreatment 2 Outlet NH3 Sensor Preliminary FMI            | 4444 |
| 4.1            | 2 bits  | Aftertreatment 2 Outlet NH3 Reading Stable                    | 4445 |
| 4.3            | 2 bits  | Aftertreatment 2 Outlet NH3 Gas Sensor Power In Range         | 4446 |
| 4.5            | 2 bits  | Aftertreatment 2 Outlet NH3 Gas Sensor at Temperature         | 4447 |
| 5.1            | 5 bits  | Aftertreatment 2 Outlet NH3 Gas Sensor Heater Preliminary FMI | 4448 |
| 6.1            | 2 bits  | Aftertreatment 2 Outlet NH3 Gas Sensor Heater Control         | 4449 |



**PGN 61481****Slope Sensor Information 2****SSI/2**

The Slope Sensor Information 2 message shall provide a measurement of the vehicle's extended pitch angle and a measurement of the vehicle's extended roll angle.

Vehicle axis system defined in SAE J670e, Vehicle Dynamics Terminology.

Vehicle Roll Angle – The angle between the vehicle y-axis and the ground plane.

Vehicle Pitch Angle – The angle between the vehicle x-axis and the ground plane.

The data within the message shall contain the measured pitch and roll, figure of merits for the pitch and roll, a compensated measurement indicator for each measurement, and the measurement latency for the sensor measurements.

Note 1) When this PGN is used to transmit information from a device not attached to the vehicle, the components local frame of reference shall be used.

Note 2) The NAME of the source of the PGN shall be used to associate to the frame of reference. (e.g, Machine control will report vehicle pitch and roll, blade control will report blade pitch and roll).

|                               |                  |                             |
|-------------------------------|------------------|-----------------------------|
| Transmission Repetition Rate: | 10 ms            |                             |
| Data Length:                  | 8                |                             |
| Extended Data Page:           | 0                |                             |
| Data Page:                    | 0                |                             |
| PDU Format:                   | 240              |                             |
| PDU Specific:                 | 41               | PGN Supporting Information: |
| Default Priority:             | 3                |                             |
| Parameter Group Number:       | 61481 (0x00F029) |                             |

| Start Position | Length  | Parameter Name                                    | SPN  |
|----------------|---------|---------------------------------------------------|------|
| 1-3            | 3 bytes | Pitch Angle Extended Range                        | 4976 |
| 4-6            | 3 bytes | Roll Angle Extended Range                         | 4977 |
| 7.1            | 2 bits  | Pitch Angle Extended Range Compensation           | 4978 |
| 7.3            | 2 bits  | Pitch Angle Extended Range Figure of Merit        | 4979 |
| 7.5            | 2 bits  | Roll Angle Extended Range Compensation            | 4980 |
| 7.7            | 2 bits  | Roll Angle Extended Range Figure of Merit         | 4981 |
| 8              | 1 byte  | Roll and Pitch Extended Range Measurement Latency | 4982 |

**PGN 61482 Angular Rate Information****ARI**

The Angular Rate Information message shall provide a measurement of the vehicle's pitch rate, roll rate, and yaw rate measurements.

Vehicle axis system defined in SAE J670e, Vehicle Dynamics Terminology.

Vehicle Roll Angle – The angle between the vehicle y-axis and the ground plane.

Vehicle Pitch Angle – The angle between the vehicle x-axis and the ground plane.

Note - Angular rotations are positive clockwise when looking in the positive direction of the axis about which rotation occurs.

The data within the message shall contain the measured pitch rate, roll rate, yaw rate, figure of merits for the three measurements, and measurement latency for the sensor measurements.

Note 1) When this PGN is used to transmit information from a device not attached to the vehicle, the components local frame of reference shall be used.

Note 2) The NAME of the source of the PGN shall be used to associate to the frame of reference. (e.g, Machine control will report vehicle pitch rate, roll rate, and yaw rate. Blade control will report blade pitch rate, roll rate, and yaw rate).

|                               |                  |                             |
|-------------------------------|------------------|-----------------------------|
| Transmission Repetition Rate: | 10 ms            |                             |
| Data Length:                  | 8                |                             |
| Extended Data Page:           | 0                |                             |
| Data Page:                    | 0                |                             |
| PDU Format:                   | 240              |                             |
| PDU Specific:                 | 42               | PGN Supporting Information: |
| Default Priority:             | 3                |                             |
| Parameter Group Number:       | 61482 (0x00F02A) |                             |

| Start Position | Length  | Parameter Name                            | SPN  |
|----------------|---------|-------------------------------------------|------|
| 1-2            | 2 bytes | Pitch Rate Extended Range                 | 4983 |
| 3-4            | 2 bytes | Roll Rate Extended Range                  | 4984 |
| 5-6            | 2 bytes | Yaw Rate Extended Range                   | 4985 |
| 7.1            | 2 bits  | Pitch Rate Extended Range Figure of Merit | 4986 |
| 7.3            | 2 bits  | Roll Rate Extended Range Figure of Merit  | 4987 |
| 7.5            | 2 bits  | Yaw Rate Extended Range Figure of Merit   | 4988 |
| 8              | 1 byte  | Angular Rate Measurement Latency          | 4989 |

**PGN 61483      Crash Notification****CN**

This message is transmitted in case of a crash event.

The message contains information about the Crash Type, a Crash Counter and a Checksum. The function of the Crash Counter is to prevent other ECU's from reacting to a faulty transmission of the Crash Information message.

Therefore the Crash Counter becomes incremented by 1 for every sent message, beginning with "0" for the first message.

Other ECUs should react on a state change in order to distinguish between a faulty transmission and a real crash event.

The Crash Checksum provides an additional verification of the signal path.

Transmission Repetition Rate: Transmitted every 20 msec for the first 100 msec and then broadcast every 1 sec for 10 sec in case of a crash event

Data Length: 8

Extended Data Page: 0

Data Page: 0

PDU Format: 240

PDU Specific: 43      PGN Supporting Information:

Default Priority: 0

Parameter Group Number: 61483 (0x00F02B)

| Start Position | Length | Parameter Name | SPN  |
|----------------|--------|----------------|------|
| 1.1            | 5 bits | Crash Type     | 4973 |
| 8.1            | 4 bits | Crash Counter  | 4974 |
| 8.5            | 4 bits | Crash Checksum | 4975 |

**(R) PGN 61484      Magnet Status Information 2****MSI2**

This message carries data related to the status of the magnetic material handling system, possibly including the generator that provides power to the magnet.

Transmission Repetition Rate: 50 ms

Data Length: 8

Extended Data Page: 0

Data Page: 0

PDU Format: 240

PDU Specific: 44      PGN Supporting Information:

Default Priority: 2

Parameter Group Number: 61484 (0x00F02C)

| Start Position | Length  | Parameter Name                        | SPN  |
|----------------|---------|---------------------------------------|------|
| 1-2            | 2 bytes | Magnet Forward Current                | 5008 |
| 3              | 1 byte  | Magnet Reverse Current                | 5009 |
| 4.1            | 2 bits  | Material Lift Switch                  | 5010 |
| 4.3            | 2 bits  | Material Drop Switch                  | 5011 |
| 4.5            | 2 bits  | Generator Current Boost Active Status | 5012 |
| 4.7            | 2 bits  | Material Lift Active Status           | 5013 |
| 5.1            | 2 bits  | Material Drop Active Status           | 5014 |
| 5.3            | 2 bits  | Lift Relay Control                    | 5402 |
| 5.5            | 2 bits  | Drop Relay Control                    | 5403 |

**(R) PGN 61485      Acceleration Sensor****AS**

The acceleration sensor message shall provide a measurement of the vehicle's acceleration in the lateral, longitudinal, and vertical axes.

Transmission Repetition Rate: 10 ms (default) or 20 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 240  
PDU Specific: 45                      PGN Supporting Information:  
Default Priority: 2  
Parameter Group Number: 61485 (0x00F02D)

| Start Position | Length  | Parameter Name                                                        | SPN  |
|----------------|---------|-----------------------------------------------------------------------|------|
| 1-2            | 2 bytes | Lateral Acceleration Extended Range                                   | 5347 |
| 3-4            | 2 bytes | Longitudinal Acceleration Extended Range                              | 5348 |
| 5-6            | 2 bytes | Vertical Acceleration Extended Range                                  | 5349 |
| 7.1            | 2 bits  | Lateral Acceleration Extended Range Figure of Merit                   | 5350 |
| 7.3            | 2 bits  | Longitudinal Acceleration Extended Range Figure of Merit              | 5351 |
| 7.5            | 2 bits  | Vertical Acceleration Extended Range Figure of Merit                  | 5352 |
| 7.7            | 2 bits  | Support Variable Transmission Repetition Rate for Acceleration Sensor | 5353 |

**(R) PGN 61486      Engine Turbocharger Wastegate Actuator Control Command**

This PGN will contain the Engine Turbocharger Wastegate Actuator 1 & 2 control commands

Transmission Repetition Rate: Engine speed dependent  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 240  
PDU Specific: 46                      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 61486 (0x00F02E)

| Start Position | Length  | Parameter Name                                   | SPN  |
|----------------|---------|--------------------------------------------------|------|
| 1-2            | 2 bytes | Engine Turbocharger Wastegate Actuator 1 Command | 5386 |
| 3-4            | 2 bytes | Engine Turbocharger Wastegate Actuator 2 Command | 5387 |

**(R) PGN 64743 Engine Configuration 3****EC3**

The EC3 message contains a static engine friction torque map consisting of torque points that correspond to the speed points in the EC1 message. A net brake torque map for the engine can be calculated by subtracting the static engine friction torque from the engine's corresponding indicated torque at each speed point. The static friction torque map is expected to change as engine temperature changes. It will also change when an engine speed derate is active.

For engine configuration map modes 1 and 2, points 1 through 6 correspond to the speed points in the torque map in the engine configuration message. For engine configuration map mode 3, points 1 through 5 correspond to the speed points, but point 6 corresponds to a speed point that is determined using Engine Gain (Kp) Of The Endspped Governor (SPN 545). Refer to Appendix D - PGN 65251 for a description of the modes.

Estimated Engine Parasitic Losses – Percent Torque (SPN 2978) are not accounted for in the EC3 static friction torque map. If the EC3 message is supported and parasitic losses are known, the parasitic losses must be included in Estimated Engine Parasitic Losses - Percent Torque (SPN 2978); the parasitic losses must NOT be included in Nominal Friction - Percent Torque (SPN 514).

Even though Estimated Pumping - Percent Torque (SPN 5398) is included in Nominal Friction - Percent Torque (SPN 514), Estimated Pumping - Percent Torque is not included in the computation of the static friction torque map. For a given engine speed, the relationship between the static friction torque map and Nominal Friction - Percent Torque can be determined by subtracting Estimated Pumping - Percent Torque from Nominal Friction - Percent Torque. The static friction torque map cannot include the effects of Estimated Pumping - Percent Torque because of the dynamic nature of the pumping losses.

The static friction torque at a given engine speed equals Nominal Friction - Percent Torque (SPN 514) minus Estimated Pumping - Percent Torque (SPN 5398).

|                               |                                                                                                                         |                             |  |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------|-----------------------------|--|
| Transmission Repetition Rate: | Every 5 s and on change of torque/speed points of more than 10% since last transmission but no faster than every 500 ms |                             |  |
| Data Length:                  | 8                                                                                                                       |                             |  |
| Extended Data Page:           | 0                                                                                                                       |                             |  |
| Data Page:                    | 0                                                                                                                       |                             |  |
| PDU Format:                   | 252                                                                                                                     |                             |  |
| PDU Specific:                 | 231                                                                                                                     | PGN Supporting Information: |  |
| Default Priority:             | 6                                                                                                                       |                             |  |
| Parameter Group Number:       | 64743 (0x00FCE7)                                                                                                        |                             |  |

| Start Position | Length | Parameter Name                                  | SPN  |
|----------------|--------|-------------------------------------------------|------|
| 1              | 1 byte | Engine Friction Percent Torque At Idle, Point 1 | 5471 |
| 2              | 1 byte | Engine Friction Percent Torque At Idle, Point 2 | 5472 |
| 3              | 1 byte | Engine Friction Percent Torque At Idle, Point 3 | 5473 |
| 4              | 1 byte | Engine Friction Percent Torque At Idle, Point 4 | 5474 |
| 5              | 1 byte | Engine Friction Percent Torque At Idle, Point 5 | 5475 |
| 6              | 1 byte | Engine Friction Percent Torque At Idle, Point 6 | 5476 |
| 7              | 1 byte | Engine Friction Percent Torque At Idle, Point 7 | 5477 |

**(R) PGN 64744 Intake Valve Actuation Control****IVAC**

Contains information about the intake valve actuation system control.

Transmission Repetition Rate: 500 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 252  
PDU Specific: 232 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64744 (0x00FCE8)

| Start Position | Length | Parameter Name                                                | SPN  |
|----------------|--------|---------------------------------------------------------------|------|
| 1.1            | 2 bits | Intake Valve Actuation System Oil Pressure 1 Solenoid Control | 5499 |
| 1.3            | 2 bits | Intake Valve Actuation System Oil Pressure 2 Solenoid Control | 5500 |

**(R) PGN 64745 Armrest Switch Matrix Commands****ARMSWIMC**

Operator commands sent via the Armrest Switch Matrices.

Transmission Repetition Rate: 100 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 252  
PDU Specific: 233 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64745 (0x00FCE9)

| Start Position | Length | Parameter Name                     | SPN  |
|----------------|--------|------------------------------------|------|
| 1.1            | 2 bits | Armrest Switch Matrix - Switch 1   | 1503 |
| 1.3            | 2 bits | Armrest Switch Matrix - Switch 2   | 5492 |
| 1.5            | 2 bits | Armrest Switch Matrix 2 - Switch 1 | 5493 |
| 1.7            | 2 bits | Armrest Switch Matrix 2 - Switch 2 | 5494 |

**(R) PGN 64746 Vehicle Electrical Power #4****VEP4**

Hybrid system voltage information.

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 252  
PDU Specific: 234 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64746 (0x00FCEA)

| Start Position | Length  | Parameter Name                       | SPN  |
|----------------|---------|--------------------------------------|------|
| 1-2            | 2 bytes | Hybrid Battery Pack Remaining Charge | 5464 |

**(R) PGN 64747     Aftertreatment 2 NOx Adsorber Information****AFT2NAI**

This message contains NOx adsorber information for aftertreatment system 2 (or bank 2).

Transmission Repetition Rate: 1 s  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 252  
 PDU Specific: 235                      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64747 (0x00FCEB)

| Start Position | Length | Parameter Name                                          | SPN  |
|----------------|--------|---------------------------------------------------------|------|
| 1.1            | 2 bits | Aftertreatment 2 NOx Adsorber deNOx Regeneration Status | 5460 |
| 1.3            | 2 bits | Aftertreatment 2 NOx Adsorber deSOx Regeneration Status | 5462 |

**(R) PGN 64748     Aftertreatment 1 NOx Adsorber Information****AFT1NAI**

This message contains NOx adsorber information for aftertreatment system 1 (or bank 1).

Transmission Repetition Rate: 1 s  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 252  
 PDU Specific: 236                      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64748 (0x00FCEC)

| Start Position | Length | Parameter Name                                          | SPN  |
|----------------|--------|---------------------------------------------------------|------|
| 1.1            | 2 bits | Aftertreatment 1 NOx Adsorber deNOx Regeneration Status | 5459 |
| 1.3            | 2 bits | Aftertreatment 1 NOx Adsorber deSOx Regeneration Status | 5461 |

**(R) PGN 64749     Aftertreatment 2 Warm Up Diesel Oxidation Catalyst Information****AT2WUDOC**

This PGN contains information for the warm up oxidation catalytic converter in exhaust bank 2.

Transmission Repetition Rate: 500 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 252  
 PDU Specific: 237                      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64749 (0x00FCED)

| Start Position | Length  | Parameter Name                                                        | SPN  |
|----------------|---------|-----------------------------------------------------------------------|------|
| 1-2            | 2 bytes | Aftertreatment 2 Warm Up Diesel Oxidation Catalyst Intake Temperature | 5315 |
| 3-4            | 2 bytes | Aftertreatment 2 Warm Up Diesel Oxidation Catalyst Outlet Temperature | 5316 |

**(R) PGN 64750 Land Leveling System Reference Elevation Data****LLRE**

This PGN will be used to communicate the reference elvation information for the land leveling system. It will communicate the left and right blade offset data and left and right elevation deviation data.

Transmission Repetition Rate: 200 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 252  
PDU Specific: 238 PGN Supporting Information:  
Default Priority: 5  
Parameter Group Number: 64750 (0x00FCEE)

| Start Position | Length  | Parameter Name                           | SPN  |
|----------------|---------|------------------------------------------|------|
| 1-2            | 2 bytes | Blade Elevation Deviation - Left         | 5410 |
| 3-4            | 2 bytes | Blade Elevation Deviation - Right        | 5411 |
| 5-6            | 2 bytes | Blade Reference Elevation Offset - Left  | 5412 |
| 7-8            | 2 bytes | Blade Reference Elevation Offset - Right | 5413 |

**(R) PGN 64751 Engine Fluid/Pressure 11****EFL/P11**

Engine related parameters.

Transmission Repetition Rate: 500 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 252  
PDU Specific: 239 PGN Supporting Information:  
Default Priority: 5  
Parameter Group Number: 64751 (0x00FCEF)

| Start Position | Length  | Parameter Name                                                                   | SPN  |
|----------------|---------|----------------------------------------------------------------------------------|------|
| 1-2            | 2 bytes | Engine Exhaust Gas Recirculation 1 Intake Absolute Pressure                      | 5430 |
| 3-4            | 2 bytes | Engine Exhaust Gas Recirculation 1 Outlet Absolute Pressure<br>(High Resolution) | 5431 |

**(R) PGN 64752 Engine Fuel/lube systems 2****EFS2**

Contains information on the engine fuel and lube system

Transmission Repetition Rate: 500 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 252  
PDU Specific: 240 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64752 (0x00FCF0)

| Start Position | Length | Parameter Name                                             | SPN  |
|----------------|--------|------------------------------------------------------------|------|
| 1              | 1 byte | Engine Fuel Filter (Suction Side) Intake Absolute Pressure | 5417 |



**(R) PGN 64753     Engine Turbocharger Wastegate Actuator Information**

This PGN will be used to transmit the Engine Turbocharger Wastegate information .

Transmission Repetition Rate: 100 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 252  
 PDU Specific: 241                      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64753 (0x00FCF1)

| Start Position | Length | Parameter Name                                              | SPN  |
|----------------|--------|-------------------------------------------------------------|------|
| 1.1            | 5 bits | Engine Turbocharger Wastegate Actuator 2 Preliminary FMI    | 5384 |
| 1.6            | 3 bits | Engine Turbocharger Wastegate Actuator 2 Temperature Status | 5385 |
| 2.1            | 4 bits | Engine Turbocharger Wastegate Actuator 1 Operation Status   | 5451 |
| 2.5            | 4 bits | Engine Turbocharger Wastegate Actuator 2 Operation Status   | 5452 |

**(R) PGN 64754     Engine Fuel/Throttle Valve Information**

This PGN will be used to transmit the Feedback information from the Engine Throttle and Fuel Actuator.

Transmission Repetition Rate: 100 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 252  
 PDU Specific: 242                      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64754 (0x00FCF2)

| Start Position | Length | Parameter Name                             | SPN  |
|----------------|--------|--------------------------------------------|------|
| 1              | 1 byte | Engine Desired Throttle Valve 1 Position   | 5374 |
| 2.1            | 5 bits | Engine Throttle Valve 1 Preliminary FMI    | 5375 |
| 2.6            | 3 bits | Engine Throttle Valve 1 Temperature Status | 5376 |
| 3              | 1 byte | Engine Desired Throttle Valve 2 Position   | 5377 |
| 4.1            | 5 bits | Engine Throttle Valve 2 Preliminary FMI    | 5378 |
| 4.6            | 3 bits | Engine Throttle Valve 2 Temperature status | 5379 |
| 5.1            | 5 bits | Engine Fuel Valve 1 Preliminary FMI        | 5380 |
| 5.6            | 3 bits | Engine Fuel Valve 1 Temperature Status     | 5381 |
| 6.1            | 5 bits | Engine Fuel Valve 2 Preliminary FMI        | 5382 |
| 6.6            | 3 bits | Engine Fuel Valve 2 Temperature Status     | 5383 |
| 7.1            | 4 bits | Engine Throttle Valve 1 Operation Status   | 5445 |
| 7.5            | 4 bits | Engine Throttle Valve 2 Operation Status   | 5446 |
| 8.1            | 4 bits | Engine Fuel Valve 1 Operation Status       | 5447 |
| 8.5            | 4 bits | Engine Fuel Valve 2 Operation Status       | 5448 |

**(R) PGN 64755 Engine Turbocharger Compressor Bypass Information**

This PGN will contain the Engine Turbocharger Compressor Bypass information

Transmission Repetition Rate: 100 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 252  
PDU Specific: 243 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64755 (0x00FCF3)

| Start Position | Length | Parameter Name                                                      | SPN  |
|----------------|--------|---------------------------------------------------------------------|------|
| 1              | 1 byte | Engine Turbocharger Compressor Bypass Actuator 2 Position           | 5388 |
| 2              | 1 byte | Engine Desired Turbocharger Compressor Bypass Actuator 2 Position   | 5389 |
| 3.1            | 5 bits | Engine Turbocharger compressor Bypass Actuator 2 Preliminary FMI    | 5390 |
| 3.6            | 3 bits | Engine Turbocharger Compressor Bypass Actuator 2 Temperature Status | 5391 |
| 4.1            | 4 bits | Engine Turbocharger Compressor Bypass Actuator 1 Operation Status   | 5449 |
| 4.5            | 4 bits | Engine Turbocharger Compressor Bypass Actuator 2 Operation Status   | 5450 |

**(R) PGN 64756 Charge Air Cooler 2****CAC2**

Engine bank 2 Charge Air Cooler parameters

Transmission Repetition Rate: 1 sec  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 252  
PDU Specific: 244 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64756 (0x00FCF4)

| Start Position | Length  | Parameter Name                                     | SPN  |
|----------------|---------|----------------------------------------------------|------|
| 1-2            | 2 bytes | Engine Charge Air Cooler 2 Intake Temperature      | 5289 |
| 3-4            | 2 bytes | Engine Charge Air Cooler 2 Outlet Temperature      | 5290 |
| 5-6            | 2 bytes | Engine Charge Air Cooler 2 Ambient Air Temperature | 5291 |
| 7              | 1 byte  | Engine Charge Air Cooler 2 Efficiency              | 5292 |

**(R) PGN 64757 Charge Air Cooler 2 Precooler****CAC2P**

Engine bank 2 CAC precooler parameters

Transmission Repetition Rate: 1 sec  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 252  
PDU Specific: 245 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64757 (0x00FCF5)

| Start Position | Length  | Parameter Name                                          | SPN  |
|----------------|---------|---------------------------------------------------------|------|
| 1-2            | 2 bytes | Engine Charge Air Cooler 2 Precooler Intake Temperature | 5286 |
| 3-4            | 2 bytes | Engine Charge Air Cooler 2 Precooler Outlet Temperature | 5287 |
| 5              | 1 byte  | Engine Charge Air Cooler 2 Precooler Efficiency         | 5288 |

**(R) PGN 64758 Charge Air Cooler 1****CAC1**

Engine bank 1 Charge Air Cooler parameters

Transmission Repetition Rate: 1 sec  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 252  
PDU Specific: 246 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64758 (0x00FCF6)

| Start Position | Length  | Parameter Name                                     | SPN  |
|----------------|---------|----------------------------------------------------|------|
| 1-2            | 2 bytes | Engine Charge Air Cooler 1 Intake Temperature      | 5283 |
| 3-4            | 2 bytes | Engine Charge Air Cooler 1 Ambient Air Temperature | 5284 |
| 5              | 1 byte  | Engine Charge Air Cooler 1 Efficiency              | 5285 |

**(R) PGN 64759 Charge Air Cooler 1 Precooler****CAC1P**

Engine bank 1 CAC precooler parameters

Transmission Repetition Rate: 1 sec  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 252  
PDU Specific: 247 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64759 (0x00FCF7)

| Start Position | Length  | Parameter Name                                          | SPN  |
|----------------|---------|---------------------------------------------------------|------|
| 1-2            | 2 bytes | Engine Charge Air Cooler 1 Precooler Intake Temperature | 5280 |
| 3-4            | 2 bytes | Engine Charge Air Cooler 1 Precooler Outlet Temperature | 5281 |
| 5              | 1 byte  | Engine Charge Air Cooler 1 Precooler Efficiency         | 5282 |

**(R) PGN 64760 Diesel Particulate Filter 2 Soot 2****DPF2S2**

Additional diesel particulate filter soot parameters for diesel particulate filter 2.

Transmission Repetition Rate: 1 sec  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 252  
PDU Specific: 248 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64760 (0x00FCF8)

| Start Position | Length  | Parameter Name                                             | SPN  |
|----------------|---------|------------------------------------------------------------|------|
| 1-2            | 2 bytes | Diesel Particulate Filter 2 Soot Signal Standard Deviation | 5269 |
| 3-4            | 2 bytes | Diesel Particulate Filter 2 Soot Signal Maximum            | 5270 |
| 5-6            | 2 bytes | Diesel Particulate Filter 2 Soot Signal Minimum            | 5271 |

**(R) PGN 64761 Diesel Particulate Filter 1 Soot 2****DPF1S2**

Additional diesel particulate filter soot parameters for diesel particulate filter 1.

Transmission Repetition Rate: 1 sec  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 252  
PDU Specific: 249 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64761 (0x00FCF9)

| Start Position | Length  | Parameter Name                                             | SPN  |
|----------------|---------|------------------------------------------------------------|------|
| 1-2            | 2 bytes | Diesel Particulate Filter 1 Soot Signal Standard Deviation | 5266 |
| 3-4            | 2 bytes | Diesel Particulate Filter 1 Soot Signal Maximum            | 5267 |
| 5-6            | 2 bytes | Diesel Particulate Filter 1 Soot Signal Minimum            | 5268 |

**(R) PGN 64762 Electronic Engine Controller 11****EEC11**

Engine related parameters

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 252  
PDU Specific: 250 PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 64762 (0x00FCFA)

| Start Position | Length  | Parameter Name                                            | SPN  |
|----------------|---------|-----------------------------------------------------------|------|
| 1-2            | 2 bytes | Engine Exhaust Gas Recirculation 2 (EGR2) Valve Control   | 5264 |
| 3-4            | 2 bytes | Engine Exhaust Gas Recirculation 2 (EGR2) Valve 2 Control | 5265 |

**(R) PGN 64763     Engine Manifold Actuator Position****EMAP**

Engine manifold actuator position parameters

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 252  
PDU Specific: 251     PGN Supporting Information:  
Default Priority: 5  
Parameter Group Number: 64763 (0x00FCFB)

| Start Position | Length  | Parameter Name                                                      | SPN  |
|----------------|---------|---------------------------------------------------------------------|------|
| 1-2            | 2 bytes | Engine Exhaust Manifold Bank 1 Flow Balance Valve Actuator Position | 5277 |
| 3-4            | 2 bytes | Engine Exhaust Manifold Bank 2 Flow Balance Valve Actuator Position | 5279 |

**(R) PGN 64764     Engine Manifold Actuator Control****EMAC**

Engine manifold actuator control parameters.

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 252  
PDU Specific: 252     PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 64764 (0x00FCFC)

| Start Position | Length  | Parameter Name                                                     | SPN  |
|----------------|---------|--------------------------------------------------------------------|------|
| 1-2            | 2 bytes | Engine Exhaust Manifold Bank 1 Flow Balance Valve Actuator Control | 5276 |
| 3-4            | 2 bytes | Engine Exhaust Manifold Bank 2 Flow Balance Valve Actuator Control | 5278 |

**(R) PGN 64765     Electronic Engine Controller 9****EEC9**

Engine related parameters

Transmission Repetition Rate: 100 msec  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 252  
PDU Specific: 253     PGN Supporting Information:  
Default Priority: 4  
Parameter Group Number: 64765 (0x00FCFD)

| Start Position | Length  | Parameter Name                                      | SPN  |
|----------------|---------|-----------------------------------------------------|------|
| 1-2            | 2 bytes | Engine Exhaust Gas Recirculation 2 Valve Position   | 5262 |
| 3-4            | 2 bytes | Engine Exhaust Gas Recirculation 2 Valve 2 Position | 5263 |
| 5-6            | 2 bytes | Commanded Engine Fuel Rail Pressure                 | 5313 |
| 7-8            | 2 bytes | Commanded Engine Fuel Injection Control Pressure    | 5314 |

**(R) PGN 64766      Electronic Engine Controller 10****EEC10**

Engine related parameters

Transmission Repetition Rate: On request  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 252  
 PDU Specific: 254      PGN Supporting Information:  
 Default Priority: 7  
 Parameter Group Number: 64766 (0x00FCFE)

| Start Position | Length  | Parameter Name                                                                | SPN  |
|----------------|---------|-------------------------------------------------------------------------------|------|
| 1-2            | 2 bytes | Engine Exhaust Gas Recirculation 2 (EGR2) Cooler Intake Temperature           | 5258 |
| 3-4            | 2 bytes | Engine Exhaust Gas Recirculation 2 (EGR2) Cooler Intake Gas Absolute Pressure | 5259 |
| 5              | 1 byte  | Engine Exhaust Gas Recirculation 2 (EGR2) Cooler Efficiency                   | 5260 |
| 6              | 1 byte  | EGR 2 Cooler Bypass Actuator Position                                         | 5261 |

**(R) PGN 64767      Engine Temperature 5****ET5**

Engine related parameters

Transmission Repetition Rate: 1 sec  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 252  
 PDU Specific: 255      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64767 (0x00FCFF)

| Start Position | Length  | Parameter Name                                              | SPN  |
|----------------|---------|-------------------------------------------------------------|------|
| 1-2            | 2 bytes | Engine Exhaust Gas Recirculation 2 Temperature              | 5255 |
| 3-4            | 2 bytes | Engine Exhaust Gas Recirculation 2 Mixer Intake Temperature | 5256 |

**(R) PGN 64768      Engine Fluid/Pressure 10****EFL/P10**

Engine related parameters

Transmission Repetition Rate: 500 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 00      PGN Supporting Information:  
 Default Priority: 5  
 Parameter Group Number: 64768 (0x00FD00)

| Start Position | Length  | Parameter Name                                              | SPN  |
|----------------|---------|-------------------------------------------------------------|------|
| 1-2            | 2 bytes | Engine Exhaust Gas Recirculation 2 Differential Pressure    | 5252 |
| 3              | 1 byte  | Engine Exhaust Gas Recirculation 2 Intake Pressure          | 5253 |
| 4-5            | 2 bytes | Engine Exhaust Gas Recirculation 2 Outlet Absolute Pressure | 5254 |

6-7                      2 bytes                      Engine Exhaust Gas Recirculation 2 Intake Absolute Pressure                      5429

**(R) PGN 64769      Low Voltage Disconnect Status**

**LVDS**

Status of the Low-Voltage Disconnect (LVD) device.

Transmission Repetition Rate:      500 ms  
 Data Length:                      8  
 Extended Data Page:                      0  
 Data Page:                      0  
 PDU Format:                      253  
 PDU Specific:                      01                      PGN Supporting Information:  
 Default Priority:                      6  
 Parameter Group Number:                      64769 (0x00FD01)

| Start Position | Length | Parameter Name                                 | SPN  |
|----------------|--------|------------------------------------------------|------|
| 1.1            | 2 bits | Low Voltage Disconnect Manual Disconnect State | 5141 |
| 1.3            | 2 bits | Low Voltage Disconnect Manual Connect State    | 5142 |
| 1.5            | 4 bits | Low Voltage Disconnect Current Operating Mode  | 5143 |
| 2.1            | 4 bits | Low Voltage Disconnect Output #3 State         | 5144 |
| 2.5            | 4 bits | Low Voltage Disconnect Output #2 State         | 5145 |
| 3.1            | 4 bits | Low Voltage Disconnect Output #1 State         | 5146 |
| 3.5            | 4 bits | Low Voltage Disconnect Vout Output State       | 5147 |
| 4              | 1 byte | Low Voltage Disconnect Temperature             | 5148 |

**(R) PGN 64772      Direct Lamp Control Data 2**

**DLCD2**

This message will be transmitted by the controller that is illuminating the lamps.

It is not required to be used with PGN 64774.

Transmission Repetition Rate:      1 s  
 Data Length:                      8  
 Extended Data Page:                      0  
 Data Page:                      0  
 PDU Format:                      253  
 PDU Specific:                      04                      PGN Supporting Information:  
 Default Priority:                      6  
 Parameter Group Number:                      64772 (0x00FD04)

| Start Position | Length | Parameter Name                        | SPN  |
|----------------|--------|---------------------------------------|------|
| 1.1            | 2 bits | Vehicle Battery Voltage Low Lamp Data | 5104 |
| 1.3            | 2 bits | Vehicle Fuel Level Low Lamp Data      | 5105 |
| 1.5            | 2 bits | Vehicle Air Pressure Low Lamp Data    | 5106 |
| 1.7            | 2 bits | Vehicle HVAC Recirculation Lamp Data  | 5107 |
| 2.1            | 2 bits | Vehicle Battery Charging Lamp Data    | 5108 |

**(R) PGN 64773      Direct Lamp Control Data 1****DLCD1**

This message will be transmitted by the controller that is illuminating the lamps.

It is not required to be used with PGN 64775.

Transmission Repetition Rate: 1 s  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 05      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64773 (0x00FD05)

| Start Position | Length | Parameter Name                                      | SPN  |
|----------------|--------|-----------------------------------------------------|------|
| 1.1            | 2 bits | Engine Protect Lamp Data                            | 5093 |
| 1.3            | 2 bits | Engine Amber Warning Lamp Data                      | 5094 |
| 1.5            | 2 bits | Engine Red Stop Lamp Data                           | 5095 |
| 1.7            | 2 bits | OBD Malfunction Indicator Lamp Data                 | 5096 |
| 2.1            | 2 bits | Engine Brake Active Lamp Data                       | 5097 |
| 2.3            | 2 bits | Compression Brake Enable Switch Indicator Lamp Data | 5098 |
| 2.5            | 2 bits | Engine Oil Pressure Low Lamp Data                   | 5099 |
| 2.7            | 2 bits | Engine Coolant Temperature High Lamp Data           | 5100 |
| 3.1            | 2 bits | Engine Coolant Level Low Lamp Data                  | 5101 |
| 3.3            | 2 bits | Engine Idle Management Active Lamp Data             | 5102 |
| 3.5            | 2 bits | Engine Air Filter Restriction Lamp Data             | 5103 |
| 3.7            | 2 bits | Engine Fuel Filter Restricted Lamp Data             | 5470 |
| 8.7            | 2 bits | Engine Wait To Start Lamp Data                      | 5416 |

**(R) PGN 64774      Direct Lamp Control Command 2****DLCC2**

Message that directly controls the driver indicator lamps. See also PGN 64775 for additional lamps and PGN 64772 for the feedback information about these lamps.

Note: Since this message is direct lamp control, it is required that only one device have direct control of any individual lamp. It is understood that there may be applications in which not all lamps will be directly controlled by a single ECU.

Transmission Repetition Rate: Every 1 s and on change of state but no faster than every 100 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 06      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64774 (0x00FD06)

| Start Position | Length | Parameter Name                           | SPN  |
|----------------|--------|------------------------------------------|------|
| 1.1            | 2 bits | Vehicle Battery Voltage Low Lamp Command | 5087 |
| 1.3            | 2 bits | Vehicle Fuel Level Low Lamp Command      | 5088 |
| 1.5            | 2 bits | Vehicle Air Pressure Low Lamp Command    | 5089 |
| 1.7            | 2 bits | Vehicle HVAC Recirculation Lamp Command  | 5090 |
| 2.1            | 2 bits | Vehicle Battery Charging Lamp Command    | 5091 |



**(R) PGN 64775      Direct Lamp Control Command 1****DLCC1**

Message that directly controls the driver indicator lamps. See also PGN 64774 for additional lamps and PGN 64773 for the feedback information about these lamps.

Note: Since this message is direct lamp control, it is required that only one device have direct control of any individual lamp. It is understood that there may be applications in which not all lamps will be directly controlled by a single ECU.

Transmission Repetition Rate: Every 1 s and on change of state but no faster than every 100 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 07      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64775 (0x00FD07)

| Start Position | Length | Parameter Name                                         | SPN  |
|----------------|--------|--------------------------------------------------------|------|
| 1.1            | 2 bits | Engine Protect Lamp Command                            | 5077 |
| 1.3            | 2 bits | Engine Amber Warning Lamp Command                      | 5078 |
| 1.5            | 2 bits | Engine Red Stop Lamp Command                           | 5079 |
| 1.7            | 2 bits | OBD Malfunction Indicator Lamp Command                 | 5080 |
| 2.1            | 2 bits | Engine Brake Active Lamp Command                       | 5081 |
| 2.3            | 2 bits | Compression Brake Enable Switch Indicator Lamp Command | 3987 |
| 2.5            | 2 bits | Engine Oil Pressure Low Lamp Command                   | 5082 |
| 2.7            | 2 bits | Engine Coolant Temperature High Lamp Command           | 5083 |
| 3.1            | 2 bits | Engine Coolant Level Low Lamp Command                  | 5084 |
| 3.3            | 2 bits | Engine Idle Management Active Lamp Command             | 5085 |
| 3.5            | 2 bits | Engine Air Filter Restriction Lamp Command             | 5086 |
| 3.7            | 2 bits | Engine Fuel Filter Restricted Lamp Command             | 5469 |

**(R) PGN 64776      Engine oil message****EOM**

Engine oil related parameters

Transmission Repetition Rate: 30 seconds  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 08      PGN Supporting Information:  
 Default Priority: 7  
 Parameter Group Number: 64776 (0x00FD08)

| Start Position | Length  | Parameter Name                                      | SPN  |
|----------------|---------|-----------------------------------------------------|------|
| 1-2            | 2 bytes | Engine Oil Viscosity                                | 5055 |
| 3-4            | 2 bytes | Engine Oil Density                                  | 5056 |
| 5-6            | 2 bytes | Engine Oil Relative Dielectricity (high resolution) | 5468 |

**(R) PGN 64777 High Resolution Fuel Consumption (Liquid)****HRLFC**

Engine fuel consumption accumulators. See PGN 65257 for alternate resolution.

Transmission Repetition Rate: 1 s  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 09 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64777 (0x00FD09)

| Start Position | Length  | Parameter Name                         | SPN  |
|----------------|---------|----------------------------------------|------|
| 1-4            | 4 bytes | High Resolution Engine Trip Fuel       | 5053 |
| 5-8            | 4 bytes | High Resolution Engine Total Fuel Used | 5054 |

**PGN 64778 Aftertreatment 2 Outlet Gas NOx Sensor correction data 2****AT2OGC2**

Transmission Repetition Rate: On request  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 10 PGN Supporting Information:  
 Default Priority: 3  
 Parameter Group Number: 64778 (0x00FD0A)

| Start Position | Length | Parameter Name                                                          | SPN  |
|----------------|--------|-------------------------------------------------------------------------|------|
| 1              | 1 byte | Aftertreatment 2 Outlet Gas NOx Sensor Correction of pressure<br>Lambda | 5048 |
| 2              | 1 byte | Aftertreatment 2 Outlet Gas NOx Sensor Correction of pressure<br>Nox    | 5049 |
| 3              | 1 byte | Aftertreatment 2 Outlet Gas NOx Sensor NO2 Correction                   | 5050 |
| 4              | 1 byte | Aftertreatment 2 Outlet Gas NOx Sensor NH3 Correction                   | 5051 |

**PGN 64779 Aftertreatment 2 Outlet Gas NOx Sensor correction data****AT2OGC1**

Transmission Repetition Rate: On start-up, and every second until the dewpoint signal state = 1 (SPN 3240) has  
 been received by the transmitter  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 11 PGN Supporting Information:  
 Default Priority: 3  
 Parameter Group Number: 64779 (0x00FD0B)

| Start Position | Length  | Parameter Name                                                          | SPN  |
|----------------|---------|-------------------------------------------------------------------------|------|
| 1-2            | 2 bytes | Aftertreatment 2 Outlet Gas NOx Sensor Heater Ratio                     | 5045 |
| 3-4            | 2 bytes | Aftertreatment 2 Outlet Gas NOx Sensor New part deviation NOx<br>Gain   | 5046 |
| 5              | 1 byte  | Aftertreatment 2 Outlet Gas NOx Sensor New part deviation NOx<br>Offset | 5047 |

**PGN 64780      Aftertreatment 2 Intake Gas NOx Sensor correction data 2****AT2IGC2**

Transmission Repetition Rate: On request  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 12      PGN Supporting Information:  
 Default Priority: 3  
 Parameter Group Number: 64780 (0x00FD0C)

| Start Position | Length | Parameter Name                                                       | SPN  |
|----------------|--------|----------------------------------------------------------------------|------|
| 1              | 1 byte | Aftertreatment 2 Intake Gas NOx Sensor Correction of pressure Lambda | 5041 |
| 2              | 1 byte | Aftertreatment 2 Intake Gas NOx Sensor Correction of pressure Nox    | 5042 |
| 3              | 1 byte | Aftertreatment 2 Intake Gas NOx Sensor NO2 Correction                | 5043 |
| 4              | 1 byte | Aftertreatment 2 Intake Gas NOx Sensor NH3 Correction                | 5044 |

**PGN 64781      Aftertreatment 2 Intake Gas NOx Sensor correction data****AT2IGC1**

Transmission Repetition Rate: On start-up, and every second until the dewpoint signal state = 1 (SPN 3239) has been received by the transmitter  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 13      PGN Supporting Information:  
 Default Priority: 3  
 Parameter Group Number: 64781 (0x00FD0D)

| Start Position | Length  | Parameter Name                                                       | SPN  |
|----------------|---------|----------------------------------------------------------------------|------|
| 1-2            | 2 bytes | Aftertreatment 2 Intake Gas NOx Sensor Heater Ratio                  | 5038 |
| 3-4            | 2 bytes | Aftertreatment 2 Intake Gas NOx Sensor New part deviation NOx Gain   | 5039 |
| 5              | 1 byte  | Aftertreatment 2 Intake Gas NOx Sensor New part deviation NOx Offset | 5040 |

**PGN 64782      Aftertreatment 1 Outlet Gas NOx Sensor correction data 2****AT1OGC2**

Transmission Repetition Rate: On request  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 14      PGN Supporting Information:  
 Default Priority: 3  
 Parameter Group Number: 64782 (0x00FD0E)

| Start Position | Length | Parameter Name                                                       | SPN  |
|----------------|--------|----------------------------------------------------------------------|------|
| 1              | 1 byte | Aftertreatment 1 Outlet Gas NOx Sensor Correction of pressure Lambda | 5034 |

|   |        |                                                                      |      |
|---|--------|----------------------------------------------------------------------|------|
| 2 | 1 byte | Aftertreatment 1 Outlet Gas NOx Sensor Correction of pressure<br>Nox | 5035 |
| 3 | 1 byte | Aftertreatment 1 Outlet Gas NOx Sensor NO2 Correction                | 5036 |
| 4 | 1 byte | Aftertreatment 1 Outlet Gas NOx Sensor NH3 Correction                | 5037 |

**PGN 64783****Aftertreatment 1 Outlet Gas NOx Sensor correction data****AT10GC1**

Transmission Repetition Rate: On start-up, and every second until the dewpoint signal state = 1 (SPN 3238) has been received by the transmitter

Data Length: 8

Extended Data Page: 0

Data Page: 0

PDU Format: 253

PDU Specific: 15 PGN Supporting Information:

Default Priority: 3

Parameter Group Number: 64783 (0x00FD0F)

| Start Position | Length  | Parameter Name                                                          | SPN  |
|----------------|---------|-------------------------------------------------------------------------|------|
| 1-2            | 2 bytes | Aftertreatment 1 Outlet Gas NOx Sensor Heater Ratio                     | 5031 |
| 3-4            | 2 bytes | Aftertreatment 1 Outlet Gas NOx Sensor New part deviation NOx<br>Gain   | 5032 |
| 5              | 1 byte  | Aftertreatment 1 Outlet Gas NOx Sensor New part deviation NOx<br>Offset | 5033 |

**PGN 64784****Aftertreatment 1 Intake Gas NOx Sensor correction data 2****AT11GC2**

Transmission Repetition Rate: On request

Data Length: 8

Extended Data Page: 0

Data Page: 0

PDU Format: 253

PDU Specific: 16 PGN Supporting Information:

Default Priority: 3

Parameter Group Number: 64784 (0x00FD10)

| Start Position | Length | Parameter Name                                                          | SPN  |
|----------------|--------|-------------------------------------------------------------------------|------|
| 1              | 1 byte | Aftertreatment 1 Intake Gas NOx Sensor Correction of pressure<br>Lambda | 5027 |
| 2              | 1 byte | Aftertreatment 1 Intake Gas NOx Sensor Correction of pressure<br>Nox    | 5028 |
| 3              | 1 byte | Aftertreatment 1 Intake Gas NOx Sensor NO2 Correction                   | 5029 |
| 4              | 1 byte | Aftertreatment 1 Intake Gas NOx Sensor NH3 Correction                   | 5030 |

**PGN 64785****Aftertreatment 1 Intake Gas NOx Sensor correction data****AT1IGC1**

Transmission Repetition Rate: On start-up, and every second until the dewpoint signal state = 1 (SPN 3237) has been received by the transmitter

Data Length: 8

Extended Data Page: 0

Data Page: 0

PDU Format: 253

PDU Specific: 17 PGN Supporting Information:

Default Priority: 3

Parameter Group Number: 64785 (0x00FD11)

| Start Position | Length  | Parameter Name                                                       | SPN  |
|----------------|---------|----------------------------------------------------------------------|------|
| 1-2            | 2 bytes | Aftertreatment 1 Intake Gas NOx Sensor Heater Ratio                  | 5024 |
| 3-4            | 2 bytes | Aftertreatment 1 Intake Gas NOx Sensor New part deviation NOx Gain   | 5025 |
| 5              | 1 byte  | Aftertreatment 1 Intake Gas NOx Sensor New part deviation NOx Offset | 5026 |

**PGN 64786****Magnet Status Information 1****MS11**

This message carries data related to the status of the magnetic material handling system, possibly including the generator that provides power to the magnet.

Transmission Repetition Rate: 500 ms

Data Length: 8

Extended Data Page: 0

Data Page: 0

PDU Format: 253

PDU Specific: 18 PGN Supporting Information:

Default Priority: 6

Parameter Group Number: 64786 (0x00FD12)

| Start Position | Length | Parameter Name                            | SPN  |
|----------------|--------|-------------------------------------------|------|
| 1.1            | 2 bits | Generator Overheat Status                 | 5000 |
| 1.3            | 2 bits | Genset System Output Voltage Range Status | 5001 |
| 1.5            | 2 bits | Grapple/Magnet Selection Switch           | 5003 |
| 1.7            | 2 bits | Genset Softstart Active Status            | 5004 |
| 2.1            | 5 bits | Reverse Current Range Setting             | 5002 |
| 3.1            | 2 bits | Genset Enable Active Status               | 5005 |
| 3.3            | 2 bits | Voltage Monitor Active Status             | 5006 |
| 3.5            | 2 bits | Generator Duty Cycle Exceeded Status      | 5007 |

**PGN 64787 Magnet System Configuration Information****MSCI**

This message carries data related to the configuration of the magnetic material handling system, possibly including the generator that provides power to the magnet.

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 19 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64787 (0x00FD13)

| Start Position | Length  | Parameter Name     | SPN  |
|----------------|---------|--------------------|------|
| 1              | 1 byte  | Magnet Boost Time  | 4998 |
| 2-3            | 2 bytes | Magnet Rated Power | 4999 |

**PGN 64788 Battery Charger 2****BCH2**

Parameters for the battery charger connected to the auxiliary battery.

Transmission Repetition Rate: 1 sec  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 20 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64788 (0x00FD14)

| Start Position | Length  | Parameter Name                     | SPN  |
|----------------|---------|------------------------------------|------|
| 1.1            | 4 bits  | Battery Charger 2 State            | 4994 |
| 1.5            | 2 bits  | Battery Charger 2 Power Line State | 4995 |
| 2-3            | 2 bytes | Battery Charger 2 Output Voltage   | 4996 |
| 4-5            | 2 bytes | Battery Charger 2 Output Current   | 4997 |

**PGN 64789 Battery Charger 1****BCH1**

Parameters for the battery charger connected to the main battery.

Transmission Repetition Rate: 1 sec  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 21 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64789 (0x00FD15)

| Start Position | Length  | Parameter Name                     | SPN  |
|----------------|---------|------------------------------------|------|
| 1.1            | 4 bits  | Battery Charger 1 State            | 4990 |
| 1.5            | 2 bits  | Battery Charger 1 Power Line State | 4991 |
| 2-3            | 2 bytes | Battery Charger 1 Output Voltage   | 4992 |
| 4-5            | 2 bytes | Battery Charger 1 Output Current   | 4993 |

**PGN 64790      Occupant Classification System Information****OCSI**

Message containing status of Occupant Classification System for driver, passenger and rear seating positions. The PGN becomes updated every time a Beltlock Status changes in the Beltlock and Airbag Deactivation PGN.

Transmission Repetition Rate: Transmitted every 5 sec and on change of PGN 64791 but no faster than every 250 msec  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 22      PGN Supporting Information:  
 Default Priority: 5  
 Parameter Group Number: 64790 (0x00FD16)

| Start Position | Length | Parameter Name                                  | SPN  |
|----------------|--------|-------------------------------------------------|------|
| 1.1            | 3 bits | Driver Occupant Classification System Status    | 4963 |
| 1.4            | 3 bits | Passenger Occupant Classification System Status | 4964 |
| 2.1            | 2 bits | Occupant Classification System 3 Status         | 4965 |
| 2.3            | 2 bits | Occupant Classification System 4 Status         | 4966 |
| 2.5            | 2 bits | Occupant Classification System 5 Status         | 4967 |
| 2.7            | 2 bits | Occupant Classification System 6 Status         | 4968 |
| 3.1            | 2 bits | Occupant Classification System 7 Status         | 4969 |
| 3.3            | 2 bits | Occupant Classification System 8 Status         | 4970 |
| 3.5            | 2 bits | Occupant Classification System 9 Status         | 4971 |
| 3.7            | 2 bits | Occupant Classification System 10 Status        | 4972 |

**PGN 64791      Beltlock and Airbag Deactivation Switch Information****BDS**

Message containing Beltlock States and the Passenger Airbag Deactivation Switch State.

Transmission Repetition Rate: 250 msec  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 23      PGN Supporting Information:  
 Default Priority: 5  
 Parameter Group Number: 64791 (0x00FD17)

| Start Position | Length | Parameter Name                              | SPN  |
|----------------|--------|---------------------------------------------|------|
| 1.1            | 2 bits | Driver Beltlock Status                      | 4952 |
| 1.3            | 2 bits | Passenger Beltlock Status                   | 4953 |
| 1.5            | 2 bits | Beltlock 3 Status                           | 4954 |
| 1.7            | 2 bits | Beltlock 4 Status                           | 4955 |
| 2.1            | 2 bits | Beltlock 5 Status                           | 4956 |
| 2.3            | 2 bits | Beltlock 6 Status                           | 4957 |
| 2.5            | 2 bits | Beltlock 7 Status                           | 4958 |
| 2.7            | 2 bits | Beltlock 8 Status                           | 4959 |
| 3.1            | 2 bits | Beltlock 9 Status                           | 4960 |
| 3.3            | 2 bits | Beltlock 10 Status                          | 4961 |
| 3.5            | 2 bits | Passenger Airbag Deactivation Switch Status | 4962 |

**PGN 64792      Collision Sensor Information****CSI**

Message containing type and serial number for every sensor of the restraint-system. The Collision Sensor Type is required for all possible sensors, but only the serial numbers of sensors with a type that is different from "unavailable" are

included in the message. The serial numbers are delimited by an ASCII "\*\*\*". Since there can be different sensor configurations, depending on the vehicle, the message has a variable length.

Transmission Repetition Rate: On request  
 Data Length: Variable  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 24 PGN Supporting Information:  
 Default Priority: 7  
 Parameter Group Number: 64792 (0x00FD18)

| Start Position        | Length                                                   | Parameter Name                                        | SPN  |
|-----------------------|----------------------------------------------------------|-------------------------------------------------------|------|
| 1.1                   | 4 bits                                                   | Frontal Collision Sensor 1 - Type                     | 4918 |
| 1.5                   | 4 bits                                                   | Frontal Collision Sensor 2 - Type                     | 4919 |
| 2.1                   | 4 bits                                                   | Frontal Collision Sensor 3 - Type                     | 4920 |
| 2.5                   | 4 bits                                                   | Frontal Collision Sensor 4 - Type                     | 4921 |
| 3.1                   | 4 bits                                                   | Side Collision Sensor Front Left - Type               | 4922 |
| 3.5                   | 4 bits                                                   | Side Collision Sensor Mid Front Left - Type           | 4923 |
| 4.1                   | 4 bits                                                   | Side Collision Sensor Mid Rear Left - Type            | 4924 |
| 4.5                   | 4 bits                                                   | Side Collision Sensor Rear Left - Type                | 4925 |
| 5.1                   | 4 bits                                                   | Side Collision Sensor Front Right - Type              | 4926 |
| 5.5                   | 4 bits                                                   | Side Collision Sensor Mid Front Right - Type          | 4927 |
| 6.1                   | 4 bits                                                   | Side Collision Sensor Mid Rear Right - Type           | 4928 |
| 6.5                   | 4 bits                                                   | Side Collision Sensor Rear Right - Type               | 4929 |
| 7.1                   | 4 bits                                                   | Rear Collision Sensor 1 - Type                        | 4930 |
| 7.5                   | 4 bits                                                   | Rear Collision Sensor 2 - Type                        | 4931 |
| 8.1                   | 4 bits                                                   | Rear Collision Sensor 3 - Type                        | 4932 |
| 8.5                   | 4 bits                                                   | Rear Collision Sensor 4 - Type                        | 4933 |
| 9.1                   | 4 bits                                                   | Rollover Sensor - Type                                | 4934 |
| a (starts at byte 10) | Variable - up to 32 bytes followed by an "***" delimiter | Frontal Collision Sensor 1 - Serial Number            | 4935 |
| b                     | Variable - up to 32 bytes followed by an "***" delimiter | Frontal Collision Sensor 2 - Serial Number            | 4936 |
| c                     | Variable - up to 32 bytes followed by an "***" delimiter | Frontal Collision Sensor 3 - Serial Number            | 4937 |
| d                     | Variable - up to 32 bytes followed by an "***" delimiter | Frontal Collision Sensor 4 - Serial Number            | 4938 |
| e                     | Variable - up to 32 bytes followed by an "***" delimiter | Side Collision Sensor Front Left - Serial Number      | 4939 |
| f                     | Variable - up to 32 bytes followed by an "***" delimiter | Side Collision Sensor Mid Front Left - Serial Number  | 4940 |
| g                     | Variable - up to 32 bytes followed by an "***" delimiter | Side Collision Sensor Mid Rear Left - Serial Number   | 4941 |
| h                     | Variable - up to 32 bytes followed by an "***" delimiter | Side Collision Sensor Rear Left - Serial Number       | 4942 |
| i                     | Variable - up to 32 bytes followed by an "***" delimiter | Side Collision Sensor Front Right - Serial Number     | 4943 |
| j                     | Variable - up to 32 bytes followed by an "***" delimiter | Side Collision Sensor Mid Front Right - Serial Number | 4944 |
| k                     | Variable - up to 32 bytes followed by an "***" delimiter | Side Collision Sensor Mid Rear Right - Serial Number  | 4945 |



|   |                                                        |                                                  |      |
|---|--------------------------------------------------------|--------------------------------------------------|------|
| l | Variable - up to 32 bytes followed by an "*" delimiter | Side Collision Sensor Rear Right - Serial Number | 4946 |
| m | Variable - up to 32 bytes followed by an "*" delimiter | Rear Collision Sensor 1 - Serial Number          | 4947 |
| n | Variable - up to 32 bytes followed by an "*" delimiter | Rear Collision Sensor 2 - Serial Number          | 4948 |
| o | Variable - up to 32 bytes followed by an "*" delimiter | Rear Collision Sensor 3 - Serial Number          | 4949 |
| p | Variable - up to 32 bytes followed by an "*" delimiter | Rear Collision Sensor 4 - Serial Number          | 4950 |
| q | Variable - up to 32 bytes followed by an "*" delimiter | Rollover Sensor - Serial Number                  | 4951 |

**PGN 64793 Ignitor Loop Information****ILI**

Message containing resistance values for every equipped ignitor loop of the restraint-system. (Maximum of 100 Ignitor Loops.)

Byte 21-22 Special Ignitor Loop [1], if installed  
 Byte 23-24 Special Ignitor Loop [2], if installed

Up to Special Ignitor Loop [90], if installed

This entry can cover 100 ignition loops in total, where the last 90 are special ignitor loop SPNs. The SPN-names are numbered from 1 to 90.

Since there can be different ignitor loop configurations, depending on the vehicle, the message has a variable length. The first 10 standard ignitor loop parameters with exact names (SPN 4818 up to SPN 4827) are always listed in this message. The special ignitor loop parameters are listed only if equipped.

(A list with the positions of all equipped special ignitor loops is required for proper diagnostics in garage, in order to find the position of defective devices. This list has to be provided to service by the restraint system manufacturer.)

|                               |                  |                             |
|-------------------------------|------------------|-----------------------------|
| Transmission Repetition Rate: | On request       |                             |
| Data Length:                  | Variable         |                             |
| Extended Data Page:           | 0                |                             |
| Data Page:                    | 0                |                             |
| PDU Format:                   | 253              |                             |
| PDU Specific:                 | 25               | PGN Supporting Information: |
| Default Priority:             | 7                |                             |
| Parameter Group Number:       | 64793 (0x00FD19) |                             |

| Start Position | Length  | Parameter Name                                       | SPN  |
|----------------|---------|------------------------------------------------------|------|
| 001-002        | 2 bytes | Driver Airbag Ignitor Loop 1st Stage - Resistance    | 4818 |
| 003-004        | 2 bytes | Passenger Airbag Ignitor Loop 1st Stage - Resistance | 4819 |
| 005-006        | 2 bytes | Driver Airbag Ignitor Loop 2nd Stage - Resistance    | 4820 |
| 007-008        | 2 bytes | Passenger Airbag Ignitor Loop 2nd Stage - Resistance | 4821 |
| 009-010        | 2 bytes | Driver Belt Tensioner Ignitor Loop - Resistance      | 4822 |
| 011-012        | 2 bytes | Passenger Belt Tensioner Ignitor Loop - Resistance   | 4823 |
| 013-014        | 2 bytes | Side Bag Ignitor Loop 1 - Left - Resistance          | 4824 |
| 015-016        | 2 bytes | Side Bag Ignitor Loop 2 - Left - Resistance          | 4825 |
| 017-018        | 2 bytes | Side Bag Ignitor Loop 1 - Right - Resistance         | 4826 |
| 019-020        | 2 bytes | Side Bag Ignitor Loop 2 - Right - Resistance         | 4827 |
| 021-022        | 2 bytes | Special Ignitor Loop 1 - Resistance                  | 4828 |
| 023-024        | 2 bytes | Special Ignitor Loop 2 - Resistance                  | 4829 |
| 025-026        | 2 bytes | Special Ignitor Loop 3 - Resistance                  | 4830 |
| 027-028        | 2 bytes | Special Ignitor Loop 4 - Resistance                  | 4831 |
| 029-030        | 2 bytes | Special Ignitor Loop 5 - Resistance                  | 4832 |
| 031-032        | 2 bytes | Special Ignitor Loop 6 - Resistance                  | 4833 |
| 033-034        | 2 bytes | Special Ignitor Loop 7 - Resistance                  | 4834 |
| 035-036        | 2 bytes | Special Ignitor Loop 8 - Resistance                  | 4835 |
| 037-038        | 2 bytes | Special Ignitor Loop 9 - Resistance                  | 4836 |
| 039-040        | 2 bytes | Special Ignitor Loop 10 - Resistance                 | 4837 |
| 041-042        | 2 bytes | Special Ignitor Loop 11 - Resistance                 | 4838 |
| 043-044        | 2 bytes | Special Ignitor Loop 12 - Resistance                 | 4839 |
| 045-046        | 2 bytes | Special Ignitor Loop 13 - Resistance                 | 4840 |
| 047-048        | 2 bytes | Special Ignitor Loop 14 - Resistance                 | 4841 |
| 049-050        | 2 bytes | Special Ignitor Loop 15 - Resistance                 | 4842 |
| 051-052        | 2 bytes | Special Ignitor Loop 16 - Resistance                 | 4843 |
| 053-054        | 2 bytes | Special Ignitor Loop 17 - Resistance                 | 4844 |
| 055-056        | 2 bytes | Special Ignitor Loop 18 - Resistance                 | 4845 |
| 057-058        | 2 bytes | Special Ignitor Loop 19 - Resistance                 | 4846 |
| 059-060        | 2 bytes | Special Ignitor Loop 20 - Resistance                 | 4847 |
| 061-062        | 2 bytes | Special Ignitor Loop 21 - Resistance                 | 4848 |
| 063-064        | 2 bytes | Special Ignitor Loop 22 - Resistance                 | 4849 |

|         |         |                                      |      |
|---------|---------|--------------------------------------|------|
| 065-066 | 2 bytes | Special Ignitor Loop 23 - Resistance | 4850 |
| 067-068 | 2 bytes | Special Ignitor Loop 24 - Resistance | 4851 |
| 069-070 | 2 bytes | Special Ignitor Loop 25 - Resistance | 4852 |
| 071-072 | 2 bytes | Special Ignitor Loop 26 - Resistance | 4853 |
| 073-074 | 2 bytes | Special Ignitor Loop 27 - Resistance | 4854 |
| 075-076 | 2 bytes | Special Ignitor Loop 28 - Resistance | 4855 |
| 077-078 | 2 bytes | Special Ignitor Loop 29 - Resistance | 4856 |
| 079-080 | 2 bytes | Special Ignitor Loop 30 - Resistance | 4857 |
| 081-082 | 2 bytes | Special Ignitor Loop 31 - Resistance | 4858 |
| 083-084 | 2 bytes | Special Ignitor Loop 32 - Resistance | 4859 |
| 085-086 | 2 bytes | Special Ignitor Loop 33 - Resistance | 4860 |
| 087-088 | 2 bytes | Special Ignitor Loop 34 - Resistance | 4861 |
| 089-090 | 2 bytes | Special Ignitor Loop 35 - Resistance | 4862 |
| 091-092 | 2 bytes | Special Ignitor Loop 36 - Resistance | 4863 |
| 093-094 | 2 bytes | Special Ignitor Loop 37 - Resistance | 4864 |
| 095-096 | 2 bytes | Special Ignitor Loop 38 - Resistance | 4865 |
| 097-098 | 2 bytes | Special Ignitor Loop 39 - Resistance | 4866 |
| 099-100 | 2 bytes | Special Ignitor Loop 40 - Resistance | 4867 |
| 101-102 | 2 bytes | Special Ignitor Loop 41 - Resistance | 4868 |
| 103-104 | 2 bytes | Special Ignitor Loop 42 - Resistance | 4869 |
| 105-106 | 2 bytes | Special Ignitor Loop 43 - Resistance | 4870 |
| 107-108 | 2 bytes | Special Ignitor Loop 44 - Resistance | 4871 |
| 109-110 | 2 bytes | Special Ignitor Loop 45 - Resistance | 4872 |
| 111-112 | 2 bytes | Special Ignitor Loop 46 - Resistance | 4873 |
| 113-114 | 2 bytes | Special Ignitor Loop 47 - Resistance | 4874 |
| 115-116 | 2 bytes | Special Ignitor Loop 48 - Resistance | 4875 |
| 117-118 | 2 bytes | Special Ignitor Loop 49 - Resistance | 4876 |
| 119-120 | 2 bytes | Special Ignitor Loop 50 - Resistance | 4877 |
| 121-122 | 2 bytes | Special Ignitor Loop 51 - Resistance | 4878 |
| 123-124 | 2 bytes | Special Ignitor Loop 52 - Resistance | 4879 |
| 125-126 | 2 bytes | Special Ignitor Loop 53 - Resistance | 4880 |
| 127-128 | 2 bytes | Special Ignitor Loop 54 - Resistance | 4881 |
| 129-130 | 2 bytes | Special Ignitor Loop 55 - Resistance | 4882 |
| 131-132 | 2 bytes | Special Ignitor Loop 56 - Resistance | 4883 |
| 133-134 | 2 bytes | Special Ignitor Loop 57 - Resistance | 4884 |
| 135-136 | 2 bytes | Special Ignitor Loop 58 - Resistance | 4885 |
| 137-138 | 2 bytes | Special Ignitor Loop 59 - Resistance | 4886 |
| 139-140 | 2 bytes | Special Ignitor Loop 60 - Resistance | 4887 |
| 141-142 | 2 bytes | Special Ignitor Loop 61 - Resistance | 4888 |
| 145-146 | 2 bytes | Special Ignitor Loop 63 - Resistance | 4890 |
| 147-148 | 2 bytes | Special Ignitor Loop 64 - Resistance | 4891 |
| 149-150 | 2 bytes | Special Ignitor Loop 65 - Resistance | 4892 |
| 151-152 | 2 bytes | Special Ignitor Loop 66 - Resistance | 4893 |
| 153-154 | 2 bytes | Special Ignitor Loop 67 - Resistance | 4894 |
| 155-156 | 2 bytes | Special Ignitor Loop 68 - Resistance | 4895 |
| 157-158 | 2 bytes | Special Ignitor Loop 69 - Resistance | 4896 |
| 159-160 | 2 bytes | Special Ignitor Loop 70 - Resistance | 4897 |
| 161-162 | 2 bytes | Special Ignitor Loop 71 - Resistance | 4898 |
| 163-164 | 2 bytes | Special Ignitor Loop 72 - Resistance | 4899 |
| 165-166 | 2 bytes | Special Ignitor Loop 73 - Resistance | 4900 |
| 167-168 | 2 bytes | Special Ignitor Loop 74 - Resistance | 4901 |
| 169-170 | 2 bytes | Special Ignitor Loop 75 - Resistance | 4902 |
| 171-172 | 2 bytes | Special Ignitor Loop 76 - Resistance | 4903 |
| 173-174 | 2 bytes | Special Ignitor Loop 77 - Resistance | 4904 |
| 175-176 | 2 bytes | Special Ignitor Loop 78 - Resistance | 4905 |
| 177-178 | 2 bytes | Special Ignitor Loop 79 - Resistance | 4906 |
| 179-180 | 2 bytes | Special Ignitor Loop 80 - Resistance | 4907 |
| 181-182 | 2 bytes | Special Ignitor Loop 81 - Resistance | 4908 |
| 183-184 | 2 bytes | Special Ignitor Loop 82 - Resistance | 4909 |
| 185-186 | 2 bytes | Special Ignitor Loop 83 - Resistance | 4910 |
| 187-188 | 2 bytes | Special Ignitor Loop 84 - Resistance | 4911 |
| 189-190 | 2 bytes | Special Ignitor Loop 85 - Resistance | 4912 |
| 191-192 | 2 bytes | Special Ignitor Loop 86 - Resistance | 4913 |
| 193-194 | 2 bytes | Special Ignitor Loop 87 - Resistance | 4914 |
| 195-196 | 2 bytes | Special Ignitor Loop 88 - Resistance | 4915 |
| 197-198 | 2 bytes | Special Ignitor Loop 89 - Resistance | 4916 |

199-200      2 bytes      Special Ignitor Loop 90 - Resistance      4917

**PGN 64794      Aftertreatment 1 Warm Up Diesel Oxidation Catalyst Information**

**AT1WUDOC**

This PGN contains information for the warm up oxidation catalytic converter in exhaust bank 1.

Transmission Repetition Rate:      500 ms  
 Data Length:      8  
 Extended Data Page:      0  
 Data Page:      0  
 PDU Format:      253  
 PDU Specific:      26      PGN Supporting Information:  
 Default Priority:      6  
 Parameter Group Number:      64794 (0x00FD1A)

| Start Position | Length  | Parameter Name                                                        | SPN  |
|----------------|---------|-----------------------------------------------------------------------|------|
| 1-2            | 2 bytes | Aftertreatment 1 Warm Up Diesel Oxidation Catalyst Intake Temperature | 4809 |
| 3-4            | 2 bytes | Aftertreatment 1 Warm Up Diesel Oxidation Catalyst Outlet Temperature | 4810 |

**PGN 64795      Diesel Particulate Filter 2 Soot**

**DPF2S**

Diesel particulate filter soot parameters for diesel particulate filter 2.

Transmission Repetition Rate:      1 sec  
 Data Length:      8  
 Extended Data Page:      0  
 Data Page:      0  
 PDU Format:      253  
 PDU Specific:      27      PGN Supporting Information:  
 Default Priority:      6  
 Parameter Group Number:      64795 (0x00FD1B)

| Start Position | Length  | Parameter Name                                          | SPN  |
|----------------|---------|---------------------------------------------------------|------|
| 1              | 1 byte  | Diesel Particulate Filter 2 Soot Mass                   | 4786 |
| 2              | 1 byte  | Diesel Particulate Filter 2 Soot Density                | 4787 |
| 3-4            | 2 bytes | Diesel Particulate Filter 2 Mean Soot Signal            | 4788 |
| 5-6            | 2 bytes | Diesel Particulate Filter 2 Median Soot Signal          | 4789 |
| 7.1            | 5 bits  | Diesel Particulate Filter 2 Soot Sensor Preliminary FMI | 4790 |

**PGN 64796      Diesel Particulate Filter 1 Soot**

**DPF1S**

Diesel particulate filter soot parameters for diesel particulate filter 1.

Transmission Repetition Rate:      1 sec  
 Data Length:      8  
 Extended Data Page:      0  
 Data Page:      0  
 PDU Format:      253  
 PDU Specific:      28      PGN Supporting Information:  
 Default Priority:      6  
 Parameter Group Number:      64796 (0x00FD1C)

| Start Position | Length | Parameter Name                           | SPN  |
|----------------|--------|------------------------------------------|------|
| 1              | 1 byte | Diesel Particulate Filter 1 Soot Mass    | 4781 |
| 2              | 1 byte | Diesel Particulate Filter 1 Soot Density | 4782 |

|     |         |                                                         |      |
|-----|---------|---------------------------------------------------------|------|
| 3-4 | 2 bytes | Diesel Particulate Filter 1 Mean Soot Signal            | 4783 |
| 5-6 | 2 bytes | Diesel Particulate Filter 1 Median Soot Signal          | 4784 |
| 7.1 | 5 bits  | Diesel Particulate Filter 1 Soot Sensor Preliminary FMI | 4785 |

**PGN 64797      Aftertreatment Differential Temperature 2****ATDT2**

The purpose of this PGN is to group the aftertreatment differential temperature data. These values include the differential temperature measure between the intake and outlet of aftertreatment components.

|                               |                  |                                                        |
|-------------------------------|------------------|--------------------------------------------------------|
| Transmission Repetition Rate: | On request       |                                                        |
| Data Length:                  | 8                |                                                        |
| Extended Data Page:           | 0                |                                                        |
| Data Page:                    | 0                |                                                        |
| PDU Format:                   | 253              |                                                        |
| PDU Specific:                 | 29               | PGN Supporting Information: See Appendix D - PGN 64948 |
| Default Priority:             | 6                |                                                        |
| Parameter Group Number:       | 64797 (0x00FD1D) |                                                        |

| Start Position | Length  | Parameter Name                                                   | SPN  |
|----------------|---------|------------------------------------------------------------------|------|
| 1-2            | 2 bytes | Aftertreatment 1 Three Way Catalyst Differential Gas Temperature | 4779 |
| 3-4            | 2 bytes | Aftertreatment 2 Three Way Catalyst Differential Gas Temperature | 4780 |

**PGN 64798      Aftertreatment Differential Temperature 1****ATDT1**

The purpose of this PGN is to group the aftertreatment differential temperature data. These values include the differential temperature measure between the intake and outlet of aftertreatment components.

|                               |                  |                                                        |
|-------------------------------|------------------|--------------------------------------------------------|
| Transmission Repetition Rate: | On request       |                                                        |
| Data Length:                  | 8                |                                                        |
| Extended Data Page:           | 0                |                                                        |
| Data Page:                    | 0                |                                                        |
| PDU Format:                   | 253              |                                                        |
| PDU Specific:                 | 30               | PGN Supporting Information: See Appendix D - PGN 64948 |
| Default Priority:             | 6                |                                                        |
| Parameter Group Number:       | 64798 (0x00FD1E) |                                                        |

| Start Position | Length  | Parameter Name                                                       | SPN  |
|----------------|---------|----------------------------------------------------------------------|------|
| 1-2            | 2 bytes | Aftertreatment 1 Gas Oxidation Catalyst Differential Gas Temperature | 4777 |
| 3-4            | 2 bytes | Aftertreatment 2 Gas Oxidation Catalyst Differential Gas Temperature | 4778 |

**(R) PGN 64799      Aftertreatment 2 Diesel Oxidation Catalyst****A2DOC**

The purpose of this PGN is to group the aftertreatment diesel oxidation catalyst data for bank 2. These values include the intake temperature, outlet temperature and differential pressure as well as the associated preliminary FMIs. The diesel parameters should be used with engines fueled by diesel fuel (not gaseous fuel like natural gas or propane). Separate parameters have been defined for gas fueled engines.

Note: The 5 bits of SPN 4775 are positioned into the data field in the following manner. The 2 most significant bits are placed in bits 2-1 of byte 8 such that the most significant bit of SPN 4775 located at byte 8 bit 2, and the 3 least significant bits are placed in bits 8-6 of byte 7 such that the least significant bit of SPN 4775 located at byte 7 bit 6.

Transmission Repetition Rate: 500 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 31      PGN Supporting Information: See Appendix D - PGN 64948  
 Default Priority: 6  
 Parameter Group Number: 64799 (0x00FD1F)

| Start Position | Length  | Parameter Name                                                                    | SPN  |
|----------------|---------|-----------------------------------------------------------------------------------|------|
| 1-2            | 2 bytes | Aftertreatment 2 Diesel Oxidation Catalyst Intake Gas Temperature                 | 4771 |
| 3-4            | 2 bytes | Aftertreatment 2 Diesel Oxidation Catalyst Outlet Gas Temperature                 | 4772 |
| 5-6            | 2 bytes | Aftertreatment 2 Diesel Oxidation Catalyst Differential Pressure                  | 4773 |
| 7.1            | 5 bits  | Aftertreatment 2 Diesel Oxidation Catalyst Intake Gas Temperature Preliminary FMI | 4774 |
| 7.6-8.1        | 5 bits  | Aftertreatment 2 Diesel Oxidation Catalyst Outlet Gas Temperature Preliminary FMI | 4775 |
| 8.3            | 5 bits  | Aftertreatment 2 Diesel Oxidation Catalyst Differential Pressure Preliminary FMI  | 4776 |

**(R) PGN 64800     Aftertreatment 1 Diesel Oxidation Catalyst****A1DOC**

The purpose of this PGN is to group the aftertreatment diesel oxidation catalyst data for bank 1. These values include the intake temperature, outlet temperature and differential pressure as well as the associated preliminary FMIs. The diesel parameters should be used with engines fueled by diesel fuel (not gaseous fuel like natural gas or propane). Separate parameters have been defined for gas fueled engines.

Note: The 5 bits of SPN 4769 are positioned into the data field in the following manner. The 2 most significant bits are placed in bits 2-1 of byte 8 such that the most significant bit of SPN 4769 located at byte 8 bit 2, and the 3 least significant bits are placed in bits 8-6 of byte 7 such that the least significant bit of SPN 4769 located at byte 7 bit 6.

Transmission Repetition Rate: 500 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 32                      PGN Supporting Information: See Appendix D - PGN 64948  
 Default Priority: 6  
 Parameter Group Number: 64800 (0x00FD20)

| Start Position | Length  | Parameter Name                                                                    | SPN  |
|----------------|---------|-----------------------------------------------------------------------------------|------|
| 1-2            | 2 bytes | Aftertreatment 1 Diesel Oxidation Catalyst Intake Gas Temperature                 | 4765 |
| 3-4            | 2 bytes | Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature                 | 4766 |
| 5-6            | 2 bytes | Aftertreatment 1 Diesel Oxidation Catalyst Differential Pressure                  | 4767 |
| 7.1            | 5 bits  | Aftertreatment 1 Diesel Oxidation Catalyst Intake Gas Temperature Preliminary FMI | 4768 |
| 7.6-8.1        | 5 bits  | Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature Preliminary FMI | 4769 |
| 8.3            | 5 bits  | Aftertreatment 1 Diesel Oxidation Catalyst Differential Pressure Preliminary FMI  | 4770 |

**(R) PGN 64801     Aftertreatment 2 Gas Oxidation Catalyst**

**A2GOC**

The purpose of this PGN is to group the aftertreatment gas oxidation catalyst data for bank 2. These values include the intake temperature, outlet temperature and differential pressure as well as the associated preliminary FMIs. The gas parameters should be used with engines fueled by gaseous fuel like natural gas or propane. Separate parameters have been defined for diesel fueled engines.

Note: The 5 bits of SPN 4763 are positioned into the data field in the following manner. The 2 most significant bits are placed in bits 2-1 of byte 8 such that the most significant bit of SPN 4763 located at byte 8 bit 2, and the 3 least significant bits are placed in bits 8-6 of byte 7 such that the least significant bit of SPN 4763 located at byte 7 bit 6.

Transmission Repetition Rate:     500 ms

Data Length:                         8

Extended Data Page:                0

Data Page:                            0

PDU Format:                            253

PDU Specific:                        33                     PGN Supporting Information: See Appendix D - PGN 64948

Default Priority:                      6

Parameter Group Number:         64801 (0x00FD21)

| Start Position | Length  | Parameter Name                                                                 | SPN  |
|----------------|---------|--------------------------------------------------------------------------------|------|
| 1-2            | 2 bytes | Aftertreatment 2 Gas Oxidation Catalyst Intake Gas Temperature                 | 4759 |
| 3-4            | 2 bytes | Aftertreatment 2 Gas Oxidation Catalyst Outlet Gas Temperature                 | 4760 |
| 5-6            | 2 bytes | Aftertreatment 2 Gas Oxidation Catalyst Differential Pressure                  | 4761 |
| 7.1            | 5 bits  | Aftertreatment 2 Gas Oxidation Catalyst Intake Gas Temperature Preliminary FMI | 4762 |
| 7.6-8.1        | 5 bits  | Aftertreatment 2 Gas Oxidation Catalyst Outlet Gas Temperature Preliminary FMI | 4763 |
| 8.3            | 5 bits  | Aftertreatment 2 Gas Oxidation Catalyst Differential Pressure Preliminary FMI  | 4764 |



**(R) PGN 64802     Aftertreatment 1 Gas Oxidation Catalyst****A1GOC**

The purpose of this PGN is to group the aftertreatment gas oxidation catalyst data for bank 1. These values include the intake temperature, outlet temperature and differential pressure as well as the associated preliminary FMIs. The gas parameters should be used with engines fueled by gaseous fuel like natural gas or propane. Separate parameters have been defined for diesel fueled engines.

Note: The 5 bits of SPN 4757 are positioned into the data field in the following manner. The 2 most significant bits are placed in bits 2-1 of byte 8 such that the most significant bit of SPN 4757 located at byte 8 bit 2, and the 3 least significant bits are placed in bits 8-6 of byte 7 such that the least significant bit of SPN 4757 located at byte 7 bit 6.

Transmission Repetition Rate: 500 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 34                      PGN Supporting Information: See Appendix D - PGN 64948  
 Default Priority: 6  
 Parameter Group Number: 64802 (0x00FD22)

| Start Position | Length  | Parameter Name                                                                 | SPN  |
|----------------|---------|--------------------------------------------------------------------------------|------|
| 1-2            | 2 bytes | Aftertreatment 1 Gas Oxidation Catalyst Intake Gas Temperature                 | 4753 |
| 3-4            | 2 bytes | Aftertreatment 1 Gas Oxidation Catalyst Outlet Gas Temperature                 | 4754 |
| 5-6            | 2 bytes | Aftertreatment 1 Gas Oxidation Catalyst Differential Pressure                  | 4755 |
| 7.1            | 5 bits  | Aftertreatment 1 Gas Oxidation Catalyst Intake Gas Temperature Preliminary FMI | 4756 |
| 7.6-8.1        | 5 bits  | Aftertreatment 1 Gas Oxidation Catalyst Outlet Gas Temperature Preliminary FMI | 4757 |
| 8.3            | 5 bits  | Aftertreatment 1 Gas Oxidation Catalyst Differential Pressure Preliminary FMI  | 4758 |

**PGN 64803****Extended Joystick Message 10****EJM10**

Used to transfer information about the measured status of three additional axes of a joystick and switches of the joystick grip or handle. The joystick axial motion information is available in the Basic Joystick Message.

10-bit position parameters are broadcast over 2 bytes. The eight most significant bits are transmitted in the second byte, with the most significant bit at bit 8. The two least significant bits are transmitted in the first byte in bit positions 7 and 8, with the most significant of the two bits at bit 8.

| 10-bit position SPN | Location in PGN |       |
|---------------------|-----------------|-------|
| Bit 10              | Byte n          | Bit 8 |
| Bit 9               |                 | Bit 7 |
| Bit 8               |                 | Bit 6 |
| Bit 7               |                 | Bit 5 |
| Bit 6               |                 | Bit 4 |
| Bit 5               |                 | Bit 3 |
| Bit 4               |                 | Bit 2 |
| Bit 3               |                 | Bit 1 |
| Bit 2               | Byte (n-1)      | Bit 8 |
| Bit 1               |                 | Bit 7 |

Note: The term Grip used here simply refers to another set of axes separate from the previously mentioned X and Y Axis. This additional set of axes could in some cases be grip mounted sensors as opposed to the sensors mounted at the base of the handle.

|                               |                                                                                                                                                                                                                                 |                             |  |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|--|
| Transmission Repetition Rate: | Every 100 ms and on change of state, but no faster than every 20 ms. Grandfathered definition for systems that implemented this message prior to July, 2010: Every 100 ms or on change of state, but no faster than every 20 ms |                             |  |
| Data Length:                  | 8                                                                                                                                                                                                                               |                             |  |
| Extended Data Page:           | 0                                                                                                                                                                                                                               |                             |  |
| Data Page:                    | 0                                                                                                                                                                                                                               |                             |  |
| PDU Format:                   | 253                                                                                                                                                                                                                             |                             |  |
| PDU Specific:                 | 35                                                                                                                                                                                                                              | PGN Supporting Information: |  |
| Default Priority:             | 3                                                                                                                                                                                                                               |                             |  |
| Parameter Group Number:       | 64803 (0x00FD23)                                                                                                                                                                                                                |                             |  |

| Start Position | Length  | Parameter Name                                                    | SPN  |
|----------------|---------|-------------------------------------------------------------------|------|
| 1.1            | 2 bits  | Joystick 10 Grip X-Axis Neutral Position Status                   | 4735 |
| 1.3            | 2 bits  | Joystick 10 Grip X-Axis Lever Left Negative Position Status       | 4736 |
| 1.5            | 2 bits  | Joystick 10 Grip X-Axis Lever Right Positive Position Status      | 4737 |
| 1.7-2          | 10 bits | Joystick 10 Grip X-Axis Position                                  | 4738 |
| 3.1            | 2 bits  | Joystick 10 Grip Y-Axis Neutral Position Status                   | 4739 |
| 3.3            | 2 bits  | Joystick 10 Grip Y-Axis Lever Back Negative Position Status       | 4740 |
| 3.5            | 2 bits  | Joystick 10 Grip Y-Axis Lever Forward Positive Position Status    | 4741 |
| 3.7-4          | 10 bits | Joystick 10 Grip Y-Axis Position                                  | 4742 |
| 5.1            | 2 bits  | Joystick 10 Theta-Axis Neutral Position Status                    | 4743 |
| 5.3            | 2 bits  | Joystick 10 Theta-Axis Counter Clockwise Negative Position Status | 4744 |
| 5.5            | 2 bits  | Joystick 10 Theta-Axis Clockwise Positive Position Status         | 4745 |
| 5.7-6          | 10 bits | Joystick 10 Theta-Axis Position                                   | 4746 |
| 7.3            | 2 bits  | Joystick 10 Theta-Axis Detent Position Status                     | 4747 |
| 7.5            | 2 bits  | Joystick 10 Grip Y-Axis Detent Position Status                    | 4748 |
| 7.7            | 2 bits  | Joystick 10 Grip X-Axis Detent Position Status                    | 4749 |

**PGN 64804****Basic Joystick Message 10****BJM10**

Used to transfer information about the measured status of the 1st 2 axes and up to 12 buttons of a joystick. Additional handle information is available in the Expanded Joystick Message.

10-bit position parameters are broadcast over 2 bytes. The eight most significant bits are transmitted in the second byte, with the most significant bit at bit 8. The two least significant bits are transmitted in the first byte in bit positions 7 and 8, with the most significant of the two bits at bit 8.

| 10-bit position SPN | Location in PGN |       |
|---------------------|-----------------|-------|
| Bit 10              | Byte n          | Bit 8 |
| Bit 9               |                 | Bit 7 |
| Bit 8               |                 | Bit 6 |
| Bit 7               |                 | Bit 5 |
| Bit 6               |                 | Bit 4 |
| Bit 5               |                 | Bit 3 |
| Bit 4               |                 | Bit 2 |
| Bit 3               |                 | Bit 1 |
| Bit 2               | Byte (n-1)      | Bit 8 |
| Bit 1               |                 | Bit 7 |

|                               |                                                                                                                                                                                                                                 |                             |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| Transmission Repetition Rate: | Every 100 ms and on change of state, but no faster than every 20 ms. Grandfathered definition for systems that implemented this message prior to July, 2010: Every 100 ms or on change of state, but no faster than every 20 ms |                             |
| Data Length:                  | 8                                                                                                                                                                                                                               |                             |
| Extended Data Page:           | 0                                                                                                                                                                                                                               |                             |
| Data Page:                    | 0                                                                                                                                                                                                                               |                             |
| PDU Format:                   | 253                                                                                                                                                                                                                             |                             |
| PDU Specific:                 | 36                                                                                                                                                                                                                              | PGN Supporting Information: |
| Default Priority:             | 3                                                                                                                                                                                                                               |                             |
| Parameter Group Number:       | 64804 (0x00FD24)                                                                                                                                                                                                                |                             |

| Start Position | Length  | Parameter Name                                            | SPN  |
|----------------|---------|-----------------------------------------------------------|------|
| 1.1            | 2 bits  | Joystick 10 X-Axis Neutral Position Status                | 4713 |
| 1.3            | 2 bits  | Joystick 10 X-Axis Lever Left Negative Position Status    | 4714 |
| 1.5            | 2 bits  | Joystick 10 X-Axis Lever Right Positive Position Status   | 4715 |
| 1.7-2          | 10 bits | Joystick 10 X-Axis Position                               | 4716 |
| 3.1            | 2 bits  | Joystick 10 Y-Axis Neutral Position Status                | 4717 |
| 3.3            | 2 bits  | Joystick 10 Y-Axis Lever Back Negative Position Status    | 4718 |
| 3.5            | 2 bits  | Joystick 10 Y-Axis Lever Forward Positive Position Status | 4719 |
| 3.7-4          | 10 bits | Joystick 10 Y-Axis Position                               | 4720 |
| 5.5            | 2 bits  | Joystick 10 Y-Axis Detent Position Status                 | 4721 |
| 5.7            | 2 bits  | Joystick 10 X-Axis Detent Position Status                 | 4722 |
| 6.1            | 2 bits  | Joystick 10 Button 4 Pressed Status                       | 4723 |
| 6.3            | 2 bits  | Joystick 10 Button 3 Pressed Status                       | 4724 |
| 6.5            | 2 bits  | Joystick 10 Button 2 Pressed Status                       | 4725 |
| 6.7            | 2 bits  | Joystick 10 Button 1 Pressed Status                       | 4726 |
| 7.1            | 2 bits  | Joystick 10 Button 8 Pressed Status                       | 4727 |
| 7.3            | 2 bits  | Joystick 10 Button 7 Pressed Status                       | 4728 |
| 7.5            | 2 bits  | Joystick 10 Button 6 Pressed Status                       | 4729 |
| 7.7            | 2 bits  | Joystick 10 Button 5 Pressed Status                       | 4730 |
| 8.1            | 2 bits  | Joystick 10 Button 12 Pressed Status                      | 4731 |
| 8.3            | 2 bits  | Joystick 10 Button 11 Pressed Status                      | 4732 |
| 8.5            | 2 bits  | Joystick 10 Button 10 Pressed Status                      | 4733 |
| 8.7            | 2 bits  | Joystick 10 Button 9 Pressed Status                       | 4734 |

**PGN 64805 Extended Joystick Message 9****EJM9**

Used to transfer information about the measured status of three additional axes of a joystick and switches of the joystick grip or handle. The joystick axial motion information is available in the Basic Joystick Message.

10-bit position parameters are broadcast over 2 bytes. The eight most significant bits are transmitted in the second byte, with the most significant bit at bit 8. The two least significant bits are transmitted in the first byte in bit positions 7 and 8, with the most significant of the two bits at bit 8.

| 10-bit position SPN | Location in PGN |       |
|---------------------|-----------------|-------|
| Bit 10              | Byte n          | Bit 8 |
| Bit 9               |                 | Bit 7 |
| Bit 8               |                 | Bit 6 |
| Bit 7               |                 | Bit 5 |
| Bit 6               |                 | Bit 4 |
| Bit 5               |                 | Bit 3 |
| Bit 4               |                 | Bit 2 |
| Bit 3               |                 | Bit 1 |
| Bit 2               | Byte (n-1)      | Bit 8 |
| Bit 1               |                 | Bit 7 |

Note: The term Grip used here simply refers to another set of axes separate from the previously mentioned X and Y Axis. This additional set of axes could in some cases be grip mounted sensors as opposed to the sensors mounted at the base of the handle.

|                               |                                                                                                                                                                                                                                 |                             |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| Transmission Repetition Rate: | Every 100 ms and on change of state, but no faster than every 20 ms. Grandfathered definition for systems that implemented this message prior to July, 2010: Every 100 ms or on change of state, but no faster than every 20 ms |                             |
| Data Length:                  | 8                                                                                                                                                                                                                               |                             |
| Extended Data Page:           | 0                                                                                                                                                                                                                               |                             |
| Data Page:                    | 0                                                                                                                                                                                                                               |                             |
| PDU Format:                   | 253                                                                                                                                                                                                                             |                             |
| PDU Specific:                 | 37                                                                                                                                                                                                                              | PGN Supporting Information: |
| Default Priority:             | 3                                                                                                                                                                                                                               |                             |
| Parameter Group Number:       | 64805 (0x00FD25)                                                                                                                                                                                                                |                             |

| Start Position | Length  | Parameter Name                                                   | SPN  |
|----------------|---------|------------------------------------------------------------------|------|
| 1.1            | 2 bits  | Joystick 9 Grip X-Axis Neutral Position Status                   | 4698 |
| 1.3            | 2 bits  | Joystick 9 Grip X-Axis Lever Left Negative Position Status       | 4699 |
| 1.5            | 2 bits  | Joystick 9 Grip X-Axis Lever Right Positive Position Status      | 4700 |
| 1.7-2          | 10 bits | Joystick 9 Grip X-Axis Position                                  | 4701 |
| 3.1            | 2 bits  | Joystick 9 Grip Y-Axis Neutral Position Status                   | 4702 |
| 3.3            | 2 bits  | Joystick 9 Grip Y-Axis Lever Back Negative Position Status       | 4703 |
| 3.5            | 2 bits  | Joystick 9 Grip Y-Axis Lever Forward Positive Position Status    | 4704 |
| 3.7-4          | 10 bits | Joystick 9 Grip Y-Axis Position                                  | 4705 |
| 5.1            | 2 bits  | Joystick 9 Theta-Axis Neutral Position Status                    | 4706 |
| 5.3            | 2 bits  | Joystick 9 Theta-Axis Counter Clockwise Negative Position Status | 4707 |
| 5.5            | 2 bits  | Joystick 9 Theta-Axis Clockwise Positive Position Status         | 4708 |
| 5.7-6          | 10 bits | Joystick 9 Theta-Axis Position                                   | 4709 |
| 7.3            | 2 bits  | Joystick 9 Theta-Axis Detent Position Status                     | 4710 |
| 7.5            | 2 bits  | Joystick 9 Grip Y-Axis Detent Position Status                    | 4711 |
| 7.7            | 2 bits  | Joystick 9 Grip X-Axis Detent Position Status                    | 4712 |

**PGN 64806****Basic Joystick Message 9****BJM9**

Used to transfer information about the measured status of the 1st 2 axes and up to 12 buttons of a joystick. Additional handle information is available in the Expanded Joystick Message.

10-bit position parameters are broadcast over 2 bytes. The eight most significant bits are transmitted in the second byte, with the most significant bit at bit 8. The two least significant bits are transmitted in the first byte in bit positions 7 and 8, with the most significant of the two bits at bit 8.

| 10-bit position SPN | Location in PGN |       |
|---------------------|-----------------|-------|
| Bit 10              | Byte n          | Bit 8 |
| Bit 9               |                 | Bit 7 |
| Bit 8               |                 | Bit 6 |
| Bit 7               |                 | Bit 5 |
| Bit 6               |                 | Bit 4 |
| Bit 5               |                 | Bit 3 |
| Bit 4               |                 | Bit 2 |
| Bit 3               |                 | Bit 1 |
| Bit 2               | Byte (n-1)      | Bit 8 |
| Bit 1               |                 | Bit 7 |

|                               |                                                                                                                                                                                                                                 |                             |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| Transmission Repetition Rate: | Every 100 ms and on change of state, but no faster than every 20 ms. Grandfathered definition for systems that implemented this message prior to July, 2010: Every 100 ms or on change of state, but no faster than every 20 ms |                             |
| Data Length:                  | 8                                                                                                                                                                                                                               |                             |
| Extended Data Page:           | 0                                                                                                                                                                                                                               |                             |
| Data Page:                    | 0                                                                                                                                                                                                                               |                             |
| PDU Format:                   | 253                                                                                                                                                                                                                             |                             |
| PDU Specific:                 | 38                                                                                                                                                                                                                              | PGN Supporting Information: |
| Default Priority:             | 3                                                                                                                                                                                                                               |                             |
| Parameter Group Number:       | 64806 (0x00FD26)                                                                                                                                                                                                                |                             |

| Start Position | Length  | Parameter Name                                           | SPN  |
|----------------|---------|----------------------------------------------------------|------|
| 1.1            | 2 bits  | Joystick 9 X-Axis Neutral Position Status                | 4676 |
| 1.3            | 2 bits  | Joystick 9 X-Axis Lever Left Negative Position Status    | 4677 |
| 1.5            | 2 bits  | Joystick 9 X-Axis Lever Right Positive Position Status   | 4678 |
| 1.7-2          | 10 bits | Joystick 9 X-Axis Position                               | 4679 |
| 3.1            | 2 bits  | Joystick 9 Y-Axis Neutral Position Status                | 4680 |
| 3.3            | 2 bits  | Joystick 9 Y-Axis Lever Back Negative Position Status    | 4681 |
| 3.5            | 2 bits  | Joystick 9 Y-Axis Lever Forward Positive Position Status | 4682 |
| 3.7-4          | 10 bits | Joystick 9 Y-Axis Position                               | 4683 |
| 5.5            | 2 bits  | Joystick 9 Y-Axis Detent Position Status                 | 4684 |
| 5.7            | 2 bits  | Joystick 9 X-Axis Detent Position Status                 | 4685 |
| 6.1            | 2 bits  | Joystick 9 Button 4 Pressed Status                       | 4686 |
| 6.3            | 2 bits  | Joystick 9 Button 3 Pressed Status                       | 4687 |
| 6.5            | 2 bits  | Joystick 9 Button 2 Pressed Status                       | 4688 |
| 6.7            | 2 bits  | Joystick 9 Button 1 Pressed Status                       | 4689 |
| 7.1            | 2 bits  | Joystick 9 Button 8 Pressed Status                       | 4690 |
| 7.3            | 2 bits  | Joystick 9 Button 7 Pressed Status                       | 4691 |
| 7.5            | 2 bits  | Joystick 9 Button 6 Pressed Status                       | 4692 |
| 7.7            | 2 bits  | Joystick 9 Button 5 Pressed Status                       | 4693 |
| 8.1            | 2 bits  | Joystick 9 Button 12 Pressed Status                      | 4694 |
| 8.3            | 2 bits  | Joystick 9 Button 11 Pressed Status                      | 4695 |
| 8.5            | 2 bits  | Joystick 9 Button 10 Pressed Status                      | 4696 |
| 8.7            | 2 bits  | Joystick 9 Button 9 Pressed Status                       | 4697 |

**PGN 64807 Extended Joystick Message 8****EJM8**

Used to transfer information about the measured status of three additional axes of a joystick and switches of the joystick grip or handle. The joystick axial motion information is available in the Basic Joystick Message.

10-bit position parameters are broadcast over 2 bytes. The eight most significant bits are transmitted in the second byte, with the most significant bit at bit 8. The two least significant bits are transmitted in the first byte in bit positions 7 and 8, with the most significant of the two bits at bit 8.

| 10-bit position SPN | Location in PGN |       |
|---------------------|-----------------|-------|
| Bit 10              | Byte n          | Bit 8 |
| Bit 9               |                 | Bit 7 |
| Bit 8               |                 | Bit 6 |
| Bit 7               |                 | Bit 5 |
| Bit 6               |                 | Bit 4 |
| Bit 5               |                 | Bit 3 |
| Bit 4               |                 | Bit 2 |
| Bit 3               |                 | Bit 1 |
| Bit 2               | Byte (n-1)      | Bit 8 |
| Bit 1               |                 | Bit 7 |

Note: The term Grip used here simply refers to another set of axes separate from the previously mentioned X and Y Axis. This additional set of axes could in some cases be grip mounted sensors as opposed to the sensors mounted at the base of the handle.

|                               |                                                                                                                                                                                                                                 |                             |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| Transmission Repetition Rate: | Every 100 ms and on change of state, but no faster than every 20 ms. Grandfathered definition for systems that implemented this message prior to July, 2010: Every 100 ms or on change of state, but no faster than every 20 ms |                             |
| Data Length:                  | 8                                                                                                                                                                                                                               |                             |
| Extended Data Page:           | 0                                                                                                                                                                                                                               |                             |
| Data Page:                    | 0                                                                                                                                                                                                                               |                             |
| PDU Format:                   | 253                                                                                                                                                                                                                             |                             |
| PDU Specific:                 | 39                                                                                                                                                                                                                              | PGN Supporting Information: |
| Default Priority:             | 3                                                                                                                                                                                                                               |                             |
| Parameter Group Number:       | 64807 (0x00FD27)                                                                                                                                                                                                                |                             |

| Start Position | Length  | Parameter Name                                                   | SPN  |
|----------------|---------|------------------------------------------------------------------|------|
| 1.1            | 2 bits  | Joystick 8 Grip X-Axis Neutral Position Status                   | 4661 |
| 1.3            | 2 bits  | Joystick 8 Grip X-Axis Lever Left Negative Position Status       | 4662 |
| 1.5            | 2 bits  | Joystick 8 Grip X-Axis Lever Right Positive Position Status      | 4663 |
| 1.7-2          | 10 bits | Joystick 8 Grip X-Axis Position                                  | 4664 |
| 3.1            | 2 bits  | Joystick 8 Grip Y-Axis Neutral Position Status                   | 4665 |
| 3.3            | 2 bits  | Joystick 8 Grip Y-Axis Lever Back Negative Position Status       | 4666 |
| 3.5            | 2 bits  | Joystick 8 Grip Y-Axis Lever Forward Positive Position Status    | 4667 |
| 3.7-4          | 10 bits | Joystick 8 Grip Y-Axis Position                                  | 4668 |
| 5.1            | 2 bits  | Joystick 8 Theta-Axis Neutral Position Status                    | 4669 |
| 5.3            | 2 bits  | Joystick 8 Theta-Axis Counter Clockwise Negative Position Status | 4670 |
| 5.5            | 2 bits  | Joystick 8 Theta-Axis Clockwise Positive Position Status         | 4671 |
| 5.7-6          | 10 bits | Joystick 8 Theta-Axis Position                                   | 4672 |
| 7.3            | 2 bits  | Joystick 8 Theta-Axis Detent Position Status                     | 4673 |
| 7.5            | 2 bits  | Joystick 8 Grip Y-Axis Detent Position Status                    | 4674 |
| 7.7            | 2 bits  | Joystick 8 Grip X-Axis Detent Position Status                    | 4675 |

**PGN 64808****Basic Joystick Message 8****BJM8**

Used to transfer information about the measured status of the 1st 2 axes and up to 12 buttons of a joystick. Additional handle information is available in the Expanded Joystick Message.

10-bit position parameters are broadcast over 2 bytes. The eight most significant bits are transmitted in the second byte, with the most significant bit at bit 8. The two least significant bits are transmitted in the first byte in bit positions 7 and 8, with the most significant of the two bits at bit 8.

| 10-bit position SPN | Location in PGN |       |
|---------------------|-----------------|-------|
| Bit 10              | Byte n          | Bit 8 |
| Bit 9               |                 | Bit 7 |
| Bit 8               |                 | Bit 6 |
| Bit 7               |                 | Bit 5 |
| Bit 6               |                 | Bit 4 |
| Bit 5               |                 | Bit 3 |
| Bit 4               |                 | Bit 2 |
| Bit 3               |                 | Bit 1 |
| Bit 2               | Byte (n-1)      | Bit 8 |
| Bit 1               |                 | Bit 7 |

|                               |                                                                                                                                                                                                                                 |                             |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| Transmission Repetition Rate: | Every 100 ms and on change of state, but no faster than every 20 ms. Grandfathered definition for systems that implemented this message prior to July, 2010: Every 100 ms or on change of state, but no faster than every 20 ms |                             |
| Data Length:                  | 8                                                                                                                                                                                                                               |                             |
| Extended Data Page:           | 0                                                                                                                                                                                                                               |                             |
| Data Page:                    | 0                                                                                                                                                                                                                               |                             |
| PDU Format:                   | 253                                                                                                                                                                                                                             |                             |
| PDU Specific:                 | 40                                                                                                                                                                                                                              | PGN Supporting Information: |
| Default Priority:             | 3                                                                                                                                                                                                                               |                             |
| Parameter Group Number:       | 64808 (0x00FD28)                                                                                                                                                                                                                |                             |

| Start Position | Length  | Parameter Name                                           | SPN  |
|----------------|---------|----------------------------------------------------------|------|
| 1.1            | 2 bits  | Joystick 8 X-Axis Neutral Position Status                | 4639 |
| 1.3            | 2 bits  | Joystick 8 X-Axis Lever Left Negative Position Status    | 4640 |
| 1.5            | 2 bits  | Joystick 8 X-Axis Lever Right Positive Position Status   | 4641 |
| 1.7-2          | 10 bits | Joystick 8 X-Axis Position                               | 4642 |
| 3.1            | 2 bits  | Joystick 8 Y-Axis Neutral Position Status                | 4643 |
| 3.3            | 2 bits  | Joystick 8 Y-Axis Lever Back Negative Position Status    | 4644 |
| 3.5            | 2 bits  | Joystick 8 Y-Axis Lever Forward Positive Position Status | 4645 |
| 3.7-4          | 10 bits | Joystick 8 Y-Axis Position                               | 4646 |
| 5.5            | 2 bits  | Joystick 8 Y-Axis Detent Position Status                 | 4647 |
| 5.7            | 2 bits  | Joystick 8 X-Axis Detent Position Status                 | 4648 |
| 6.1            | 2 bits  | Joystick 8 Button 4 Pressed Status                       | 4649 |
| 6.3            | 2 bits  | Joystick 8 Button 3 Pressed Status                       | 4650 |
| 6.5            | 2 bits  | Joystick 8 Button 2 Pressed Status                       | 4651 |
| 6.7            | 2 bits  | Joystick 8 Button 1 Pressed Status                       | 4652 |
| 7.1            | 2 bits  | Joystick 8 Button 8 Pressed Status                       | 4653 |
| 7.3            | 2 bits  | Joystick 8 Button 7 Pressed Status                       | 4654 |
| 7.5            | 2 bits  | Joystick 8 Button 6 Pressed Status                       | 4655 |
| 7.7            | 2 bits  | Joystick 8 Button 5 Pressed Status                       | 4656 |
| 8.1            | 2 bits  | Joystick 8 Button 12 Pressed Status                      | 4657 |
| 8.3            | 2 bits  | Joystick 8 Button 11 Pressed Status                      | 4658 |
| 8.5            | 2 bits  | Joystick 8 Button 10 Pressed Status                      | 4659 |
| 8.7            | 2 bits  | Joystick 8 Button 9 Pressed Status                       | 4660 |

**PGN 64809 Extended Joystick Message 7****EJM7**

Used to transfer information about the measured status of three additional axes of a joystick and switches of the joystick grip or handle. The joystick axial motion information is available in the Basic Joystick Message.

10-bit position parameters are broadcast over 2 bytes. The eight most significant bits are transmitted in the second byte, with the most significant bit at bit 8. The two least significant bits are transmitted in the first byte in bit positions 7 and 8, with the most significant of the two bits at bit 8.

| 10-bit position SPN | Location in PGN |       |
|---------------------|-----------------|-------|
| Bit 10              | Byte n          | Bit 8 |
| Bit 9               |                 | Bit 7 |
| Bit 8               |                 | Bit 6 |
| Bit 7               |                 | Bit 5 |
| Bit 6               |                 | Bit 4 |
| Bit 5               |                 | Bit 3 |
| Bit 4               |                 | Bit 2 |
| Bit 3               |                 | Bit 1 |
| Bit 2               | Byte (n-1)      | Bit 8 |
| Bit 1               |                 | Bit 7 |

Note: The term Grip used here simply refers to another set of axes separate from the previously mentioned X and Y Axis. This additional set of axes could in some cases be grip mounted sensors as opposed to the sensors mounted at the base of the handle.

|                               |                                                                                                                                                                                                                                 |                             |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| Transmission Repetition Rate: | Every 100 ms and on change of state, but no faster than every 20 ms. Grandfathered definition for systems that implemented this message prior to July, 2010: Every 100 ms or on change of state, but no faster than every 20 ms |                             |
| Data Length:                  | 8                                                                                                                                                                                                                               |                             |
| Extended Data Page:           | 0                                                                                                                                                                                                                               |                             |
| Data Page:                    | 0                                                                                                                                                                                                                               |                             |
| PDU Format:                   | 253                                                                                                                                                                                                                             |                             |
| PDU Specific:                 | 41                                                                                                                                                                                                                              | PGN Supporting Information: |
| Default Priority:             | 3                                                                                                                                                                                                                               |                             |
| Parameter Group Number:       | 64809 (0x00FD29)                                                                                                                                                                                                                |                             |

| Start Position | Length  | Parameter Name                                                   | SPN  |
|----------------|---------|------------------------------------------------------------------|------|
| 1.1            | 2 bits  | Joystick 7 Grip X-Axis Neutral Position Status                   | 4624 |
| 1.3            | 2 bits  | Joystick 7 Grip X-Axis Lever Left Negative Position Status       | 4625 |
| 1.5            | 2 bits  | Joystick 7 Grip X-Axis Lever Right Positive Position Status      | 4626 |
| 1.7-2          | 10 bits | Joystick 7 Grip X-Axis Position                                  | 4627 |
| 3.1            | 2 bits  | Joystick 7 Grip Y-Axis Neutral Position Status                   | 4628 |
| 3.3            | 2 bits  | Joystick 7 Grip Y-Axis Lever Back Negative Position Status       | 4629 |
| 3.5            | 2 bits  | Joystick 7 Grip Y-Axis Lever Forward Positive Position Status    | 4630 |
| 3.7-4          | 10 bits | Joystick 7 Grip Y-Axis Position                                  | 4631 |
| 5.1            | 2 bits  | Joystick 7 Theta-Axis Neutral Position Status                    | 4632 |
| 5.3            | 2 bits  | Joystick 7 Theta-Axis Counter Clockwise Negative Position Status | 4633 |
| 5.5            | 2 bits  | Joystick 7 Theta-Axis Clockwise Positive Position Status         | 4634 |
| 5.7-6          | 10 bits | Joystick 7 Theta-Axis Position                                   | 4635 |
| 7.3            | 2 bits  | Joystick 7 Theta-Axis Detent Position Status                     | 4636 |
| 7.5            | 2 bits  | Joystick 7 Grip Y-Axis Detent Position Status                    | 4637 |
| 7.7            | 2 bits  | Joystick 7 Grip X-Axis Detent Position Status                    | 4638 |



**PGN 64810 Basic Joystick Message 7****BJM7**

Used to transfer information about the measured status of the 1st 2 axes and up to 12 buttons of a joystick. Additional handle information is available in the Expanded Joystick Message.

10-bit position parameters are broadcast over 2 bytes. The eight most significant bits are transmitted in the second byte, with the most significant bit at bit 8. The two least significant bits are transmitted in the first byte in bit positions 7 and 8, with the most significant of the two bits at bit 8.

| 10-bit position SPN | Location in PGN |       |
|---------------------|-----------------|-------|
| Bit 10              | Byte n          | Bit 8 |
| Bit 9               |                 | Bit 7 |
| Bit 8               |                 | Bit 6 |
| Bit 7               |                 | Bit 5 |
| Bit 6               |                 | Bit 4 |
| Bit 5               |                 | Bit 3 |
| Bit 4               |                 | Bit 2 |
| Bit 3               |                 | Bit 1 |
| Bit 2               | Byte (n-1)      | Bit 8 |
| Bit 1               |                 | Bit 7 |

Transmission Repetition Rate: Every 100 ms and on change of state, but no faster than every 20 ms. Grandfathered definition for systems that implemented this message prior to July, 2010: Every 100 ms or on change of state, but no faster than every 20 ms

Data Length: 8

Extended Data Page: 0

Data Page: 0

PDU Format: 253

PDU Specific: 42 PGN Supporting Information:

Default Priority: 3

Parameter Group Number: 64810 (0x00FD2A)

| Start Position | Length  | Parameter Name                                           | SPN  |
|----------------|---------|----------------------------------------------------------|------|
| 1.1            | 2 bits  | Joystick 7 X-Axis Neutral Position Status                | 4602 |
| 1.3            | 2 bits  | Joystick 7 X-Axis Lever Left Negative Position Status    | 4603 |
| 1.5            | 2 bits  | Joystick 7 X-Axis Lever Right Positive Position Status   | 4604 |
| 1.7-2          | 10 bits | Joystick 7 X-Axis Position                               | 4605 |
| 3.1            | 2 bits  | Joystick 7 Y-Axis Neutral Position Status                | 4606 |
| 3.3            | 2 bits  | Joystick 7 Y-Axis Lever Back Negative Position Status    | 4607 |
| 3.5            | 2 bits  | Joystick 7 Y-Axis Lever Forward Positive Position Status | 4608 |
| 3.7-4          | 10 bits | Joystick 7 Y-Axis Position                               | 4609 |
| 5.5            | 2 bits  | Joystick 7 Y-Axis Detent Position Status                 | 4610 |
| 5.7            | 2 bits  | Joystick 7 X-Axis Detent Position Status                 | 4611 |
| 6.1            | 2 bits  | Joystick 7 Button 4 Pressed Status                       | 4612 |
| 6.3            | 2 bits  | Joystick 7 Button 3 Pressed Status                       | 4613 |
| 6.5            | 2 bits  | Joystick 7 Button 2 Pressed Status                       | 4614 |
| 6.7            | 2 bits  | Joystick 7 Button 1 Pressed Status                       | 4615 |
| 7.1            | 2 bits  | Joystick 7 Button 8 Pressed Status                       | 4616 |
| 7.3            | 2 bits  | Joystick 7 Button 7 Pressed Status                       | 4617 |
| 7.5            | 2 bits  | Joystick 7 Button 6 Pressed Status                       | 4618 |
| 7.7            | 2 bits  | Joystick 7 Button 5 Pressed Status                       | 4619 |
| 8.1            | 2 bits  | Joystick 7 Button 12 Pressed Status                      | 4620 |
| 8.3            | 2 bits  | Joystick 7 Button 11 Pressed Status                      | 4621 |
| 8.5            | 2 bits  | Joystick 7 Button 10 Pressed Status                      | 4622 |
| 8.7            | 2 bits  | Joystick 7 Button 9 Pressed Status                       | 4623 |

**PGN 64811 Extended Joystick Message 6****EJM6**

Used to transfer information about the measured status of three additional axes of a joystick and switches of the joystick grip or handle. The joystick axial motion information is available in the Basic Joystick Message.

10-bit position parameters are broadcast over 2 bytes. The eight most significant bits are transmitted in the second byte, with the most significant bit at bit 8. The two least significant bits are transmitted in the first byte in bit positions 7 and 8, with the most significant of the two bits at bit 8.

| 10-bit position SPN | Location in PGN |       |
|---------------------|-----------------|-------|
| Bit 10              | Byte n          | Bit 8 |
| Bit 9               |                 | Bit 7 |
| Bit 8               |                 | Bit 6 |
| Bit 7               |                 | Bit 5 |
| Bit 6               |                 | Bit 4 |
| Bit 5               |                 | Bit 3 |
| Bit 4               |                 | Bit 2 |
| Bit 3               |                 | Bit 1 |
| Bit 2               | Byte (n-1)      | Bit 8 |
| Bit 1               |                 | Bit 7 |

Note: The term Grip used here simply refers to another set of axes separate from the previously mentioned X and Y Axis. This additional set of axes could in some cases be grip mounted sensors as opposed to the sensors mounted at the base of the handle.

|                               |                                                                                                                                                                                                                                 |                             |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| Transmission Repetition Rate: | Every 100 ms and on change of state, but no faster than every 20 ms. Grandfathered definition for systems that implemented this message prior to July, 2010: Every 100 ms or on change of state, but no faster than every 20 ms |                             |
| Data Length:                  | 8                                                                                                                                                                                                                               |                             |
| Extended Data Page:           | 0                                                                                                                                                                                                                               |                             |
| Data Page:                    | 0                                                                                                                                                                                                                               |                             |
| PDU Format:                   | 253                                                                                                                                                                                                                             |                             |
| PDU Specific:                 | 43                                                                                                                                                                                                                              | PGN Supporting Information: |
| Default Priority:             | 3                                                                                                                                                                                                                               |                             |
| Parameter Group Number:       | 64811 (0x00FD2B)                                                                                                                                                                                                                |                             |

| Start Position | Length  | Parameter Name                                                   | SPN  |
|----------------|---------|------------------------------------------------------------------|------|
| 1.1            | 2 bits  | Joystick 6 Grip X-Axis Neutral Position Status                   | 4587 |
| 1.3            | 2 bits  | Joystick 6 Grip X-Axis Lever Left Negative Position Status       | 4588 |
| 1.5            | 2 bits  | Joystick 6 Grip X-Axis Lever Right Positive Position Status      | 4589 |
| 1.7-2          | 10 bits | Joystick 6 Grip X-Axis Position                                  | 4590 |
| 3.1            | 2 bits  | Joystick 6 Grip Y-Axis Neutral Position Status                   | 4591 |
| 3.3            | 2 bits  | Joystick 6 Grip Y-Axis Lever Back Negative Position Status       | 4592 |
| 3.5            | 2 bits  | Joystick 6 Grip Y-Axis Lever Forward Positive Position Status    | 4593 |
| 3.7-4          | 10 bits | Joystick 6 Grip Y-Axis Position                                  | 4594 |
| 5.1            | 2 bits  | Joystick 6 Theta-Axis Neutral Position Status                    | 4595 |
| 5.3            | 2 bits  | Joystick 6 Theta-Axis Counter Clockwise Negative Position Status | 4596 |
| 5.5            | 2 bits  | Joystick 6 Theta-Axis Clockwise Positive Position Status         | 4597 |
| 5.7-6          | 10 bits | Joystick 6 Theta-Axis Position                                   | 4598 |
| 7.3            | 2 bits  | Joystick 6 Theta-Axis Detent Position Status                     | 4599 |
| 7.5            | 2 bits  | Joystick 6 Grip Y-Axis Detent Position Status                    | 4600 |
| 7.7            | 2 bits  | Joystick 6 Grip X-Axis Detent Position Status                    | 4601 |

**PGN 64812****Basic Joystick Message 6****BJM6**

Used to transfer information about the measured status of the 1st 2 axes and up to 12 buttons of a joystick. Additional handle information is available in the Expanded Joystick Message.

10-bit position parameters are broadcast over 2 bytes. The eight most significant bits are transmitted in the second byte, with the most significant bit at bit 8. The two least significant bits are transmitted in the first byte in bit positions 7 and 8, with the most significant of the two bits at bit 8.

| 10-bit position SPN | Location in PGN |       |
|---------------------|-----------------|-------|
| Bit 10              | Byte n          | Bit 8 |
| Bit 9               |                 | Bit 7 |
| Bit 8               |                 | Bit 6 |
| Bit 7               |                 | Bit 5 |
| Bit 6               |                 | Bit 4 |
| Bit 5               |                 | Bit 3 |
| Bit 4               |                 | Bit 2 |
| Bit 3               |                 | Bit 1 |
| Bit 2               | Byte (n-1)      | Bit 8 |
| Bit 1               |                 | Bit 7 |

Transmission Repetition Rate: Every 100 ms and on change of state, but no faster than every 20 ms. Grandfathered definition for systems that implemented this message prior to July, 2010: Every 100 ms or on change of state, but no faster than every 20 ms

Data Length: 8

Extended Data Page: 0

Data Page: 0

PDU Format: 253

PDU Specific: 44 PGN Supporting Information:

Default Priority: 3

Parameter Group Number: 64812 (0x00FD2C)

| Start Position | Length  | Parameter Name                                           | SPN  |
|----------------|---------|----------------------------------------------------------|------|
| 1.1            | 2 bits  | Joystick 6 X-Axis Neutral Position Status                | 4565 |
| 1.3            | 2 bits  | Joystick 6 X-Axis Lever Left Negative Position Status    | 4566 |
| 1.5            | 2 bits  | Joystick 6 X-Axis Lever Right Positive Position Status   | 4567 |
| 1.7-2          | 10 bits | Joystick 6 X-Axis Position                               | 4568 |
| 3.1            | 2 bits  | Joystick 6 Y-Axis Neutral Position Status                | 4569 |
| 3.3            | 2 bits  | Joystick 6 Y-Axis Lever Back Negative Position Status    | 4570 |
| 3.5            | 2 bits  | Joystick 6 Y-Axis Lever Forward Positive Position Status | 4571 |
| 3.7-4          | 10 bits | Joystick 6 Y-Axis Position                               | 4572 |
| 5.5            | 2 bits  | Joystick 6 Y-Axis Detent Position Status                 | 4573 |
| 5.7            | 2 bits  | Joystick 6 X-Axis Detent Position Status                 | 4574 |
| 6.1            | 2 bits  | Joystick 6 Button 4 Pressed Status                       | 4575 |
| 6.3            | 2 bits  | Joystick 6 Button 3 Pressed Status                       | 4576 |
| 6.5            | 2 bits  | Joystick 6 Button 2 Pressed Status                       | 4577 |
| 6.7            | 2 bits  | Joystick 6 Button 1 Pressed Status                       | 4578 |
| 7.1            | 2 bits  | Joystick 6 Button 8 Pressed Status                       | 4579 |
| 7.3            | 2 bits  | Joystick 6 Button 7 Pressed Status                       | 4580 |
| 7.5            | 2 bits  | Joystick 6 Button 6 Pressed Status                       | 4581 |
| 7.7            | 2 bits  | Joystick 6 Button 5 Pressed Status                       | 4582 |
| 8.1            | 2 bits  | Joystick 6 Button 12 Pressed Status                      | 4583 |
| 8.3            | 2 bits  | Joystick 6 Button 11 Pressed Status                      | 4584 |
| 8.5            | 2 bits  | Joystick 6 Button 10 Pressed Status                      | 4585 |
| 8.7            | 2 bits  | Joystick 6 Button 9 Pressed Status                       | 4586 |

**PGN 64813 Extended Joystick Message 5****EJM5**

Used to transfer information about the measured status of three additional axes of a joystick and switches of the joystick grip or handle. The joystick axial motion information is available in the Basic Joystick Message.

10-bit position parameters are broadcast over 2 bytes. The eight most significant bits are transmitted in the second byte, with the most significant bit at bit 8. The two least significant bits are transmitted in the first byte in bit positions 7 and 8, with the most significant of the two bits at bit 8.

| 10-bit position SPN | Location in PGN |       |
|---------------------|-----------------|-------|
| Bit 10              | Byte n          | Bit 8 |
| Bit 9               |                 | Bit 7 |
| Bit 8               |                 | Bit 6 |
| Bit 7               |                 | Bit 5 |
| Bit 6               |                 | Bit 4 |
| Bit 5               |                 | Bit 3 |
| Bit 4               |                 | Bit 2 |
| Bit 3               |                 | Bit 1 |
| Bit 2               | Byte (n-1)      | Bit 8 |
| Bit 1               |                 | Bit 7 |

Note: The term Grip used here simply refers to another set of axes separate from the previously mentioned X and Y Axis. This additional set of axes could in some cases be grip mounted sensors as opposed to the sensors mounted at the base of the handle.

|                               |                                                                                                                                                                                                                                 |                             |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| Transmission Repetition Rate: | Every 100 ms and on change of state, but no faster than every 20 ms. Grandfathered definition for systems that implemented this message prior to July, 2010: Every 100 ms or on change of state, but no faster than every 20 ms |                             |
| Data Length:                  | 8                                                                                                                                                                                                                               |                             |
| Extended Data Page:           | 0                                                                                                                                                                                                                               |                             |
| Data Page:                    | 0                                                                                                                                                                                                                               |                             |
| PDU Format:                   | 253                                                                                                                                                                                                                             |                             |
| PDU Specific:                 | 45                                                                                                                                                                                                                              | PGN Supporting Information: |
| Default Priority:             | 3                                                                                                                                                                                                                               |                             |
| Parameter Group Number:       | 64813 (0x00FD2D)                                                                                                                                                                                                                |                             |

| Start Position | Length  | Parameter Name                                                   | SPN  |
|----------------|---------|------------------------------------------------------------------|------|
| 1.1            | 2 bits  | Joystick 5 Grip X-Axis Neutral Position Status                   | 4550 |
| 1.3            | 2 bits  | Joystick 5 Grip X-Axis Lever Left Negative Position Status       | 4551 |
| 1.5            | 2 bits  | Joystick 5 Grip X-Axis Lever Right Positive Position Status      | 4552 |
| 1.7-2          | 10 bits | Joystick 5 Grip X-Axis Position                                  | 4553 |
| 3.1            | 2 bits  | Joystick 5 Grip Y-Axis Neutral Position Status                   | 4554 |
| 3.3            | 2 bits  | Joystick 5 Grip Y-Axis Lever Back Negative Position Status       | 4555 |
| 3.5            | 2 bits  | Joystick 5 Grip Y-Axis Lever Forward Positive Position Status    | 4556 |
| 3.7-4          | 10 bits | Joystick 5 Grip Y-Axis Position                                  | 4557 |
| 5.1            | 2 bits  | Joystick 5 Theta-Axis Neutral Position Status                    | 4558 |
| 5.3            | 2 bits  | Joystick 5 Theta-Axis Counter Clockwise Negative Position Status | 4559 |
| 5.5            | 2 bits  | Joystick 5 Theta-Axis Clockwise Positive Position Status         | 4560 |
| 5.7-6          | 10 bits | Joystick 5 Theta-Axis Position                                   | 4561 |
| 7.3            | 2 bits  | Joystick 5 Theta-Axis Detent Position Status                     | 4562 |
| 7.5            | 2 bits  | Joystick 5 Grip Y-Axis Detent Position Status                    | 4563 |
| 7.7            | 2 bits  | Joystick 5 Grip X-Axis Detent Position Status                    | 4564 |

**PGN 64814****Basic Joystick Message 5****BJM5**

Used to transfer information about the measured status of the 1st 2 axes and up to 12 buttons of a joystick. Additional handle information is available in the Expanded Joystick Message.

10-bit position parameters are broadcast over 2 bytes. The eight most significant bits are transmitted in the second byte, with the most significant bit at bit 8. The two least significant bits are transmitted in the first byte in bit positions 7 and 8, with the most significant of the two bits at bit 8.

| 10-bit position SPN | Location in PGN |       |
|---------------------|-----------------|-------|
| Bit 10              | Byte n          | Bit 8 |
| Bit 9               |                 | Bit 7 |
| Bit 8               |                 | Bit 6 |
| Bit 7               |                 | Bit 5 |
| Bit 6               |                 | Bit 4 |
| Bit 5               |                 | Bit 3 |
| Bit 4               |                 | Bit 2 |
| Bit 3               |                 | Bit 1 |
| Bit 2               | Byte (n-1)      | Bit 8 |
| Bit 1               |                 | Bit 7 |

Transmission Repetition Rate: Every 100 ms and on change of state, but no faster than every 20 ms. Grandfathered definition for systems that implemented this message prior to July, 2010: Every 100 ms or on change of state, but no faster than every 20 ms

Data Length: 8

Extended Data Page: 0

Data Page: 0

PDU Format: 253

PDU Specific: 46 PGN Supporting Information:

Default Priority: 3

Parameter Group Number: 64814 (0x00FD2E)

| Start Position | Length  | Parameter Name                                           | SPN  |
|----------------|---------|----------------------------------------------------------|------|
| 1.1            | 2 bits  | Joystick 5 X-Axis Neutral Position Status                | 4528 |
| 1.3            | 2 bits  | Joystick 5 X-Axis Lever Left Negative Position Status    | 4529 |
| 1.5            | 2 bits  | Joystick 5 X-Axis Lever Right Positive Position Status   | 4530 |
| 1.7-2          | 10 bits | Joystick 5 X-Axis Position                               | 4531 |
| 3.1            | 2 bits  | Joystick 5 Y-Axis Neutral Position Status                | 4532 |
| 3.3            | 2 bits  | Joystick 5 Y-Axis Lever Back Negative Position Status    | 4533 |
| 3.5            | 2 bits  | Joystick 5 Y-Axis Lever Forward Positive Position Status | 4534 |
| 3.7-4          | 10 bits | Joystick 5 Y-Axis Position                               | 4535 |
| 5.5            | 2 bits  | Joystick 5 Y-Axis Detent Position Status                 | 4536 |
| 5.7            | 2 bits  | Joystick 5 X-Axis Detent Position Status                 | 4537 |
| 6.1            | 2 bits  | Joystick 5 Button 4 Pressed Status                       | 4538 |
| 6.3            | 2 bits  | Joystick 5 Button 3 Pressed Status                       | 4539 |
| 6.5            | 2 bits  | Joystick 5 Button 2 Pressed Status                       | 4540 |
| 6.7            | 2 bits  | Joystick 5 Button 1 Pressed Status                       | 4541 |
| 7.1            | 2 bits  | Joystick 5 Button 8 Pressed Status                       | 4542 |
| 7.3            | 2 bits  | Joystick 5 Button 7 Pressed Status                       | 4543 |
| 7.5            | 2 bits  | Joystick 5 Button 6 Pressed Status                       | 4544 |
| 7.7            | 2 bits  | Joystick 5 Button 5 Pressed Status                       | 4545 |
| 8.1            | 2 bits  | Joystick 5 Button 12 Pressed Status                      | 4546 |
| 8.3            | 2 bits  | Joystick 5 Button 11 Pressed Status                      | 4547 |
| 8.5            | 2 bits  | Joystick 5 Button 10 Pressed Status                      | 4548 |
| 8.7            | 2 bits  | Joystick 5 Button 9 Pressed Status                       | 4549 |

**PGN 64815 Extended Joystick Message 4****EJM4**

Used to transfer information about the measured status of three additional axes of a joystick and switches of the joystick grip or handle. The joystick axial motion information is available in the Basic Joystick Message.

10-bit position parameters are broadcast over 2 bytes. The eight most significant bits are transmitted in the second byte, with the most significant bit at bit 8. The two least significant bits are transmitted in the first byte in bit positions 7 and 8, with the most significant of the two bits at bit 8.

| 10-bit position SPN | Location in PGN |       |
|---------------------|-----------------|-------|
| Bit 10              | Byte n          | Bit 8 |
| Bit 9               |                 | Bit 7 |
| Bit 8               |                 | Bit 6 |
| Bit 7               |                 | Bit 5 |
| Bit 6               |                 | Bit 4 |
| Bit 5               |                 | Bit 3 |
| Bit 4               |                 | Bit 2 |
| Bit 3               |                 | Bit 1 |
| Bit 2               | Byte (n-1)      | Bit 8 |
| Bit 1               |                 | Bit 7 |

Note: The term Grip used here simply refers to another set of axes separate from the previously mentioned X and Y Axis. This additional set of axes could in some cases be grip mounted sensors as opposed to the sensors mounted at the base of the handle.

|                               |                                                                                                                                                                                                                                 |                             |  |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|--|
| Transmission Repetition Rate: | Every 100 ms and on change of state, but no faster than every 20 ms. Grandfathered definition for systems that implemented this message prior to July, 2010: Every 100 ms or on change of state, but no faster than every 20 ms |                             |  |
| Data Length:                  | 8                                                                                                                                                                                                                               |                             |  |
| Extended Data Page:           | 0                                                                                                                                                                                                                               |                             |  |
| Data Page:                    | 0                                                                                                                                                                                                                               |                             |  |
| PDU Format:                   | 253                                                                                                                                                                                                                             |                             |  |
| PDU Specific:                 | 47                                                                                                                                                                                                                              | PGN Supporting Information: |  |
| Default Priority:             | 3                                                                                                                                                                                                                               |                             |  |
| Parameter Group Number:       | 64815 (0x00FD2F)                                                                                                                                                                                                                |                             |  |

| Start Position | Length  | Parameter Name                                                   | SPN  |
|----------------|---------|------------------------------------------------------------------|------|
| 1.1            | 2 bits  | Joystick 4 Grip X-Axis Neutral Position Status                   | 4513 |
| 1.3            | 2 bits  | Joystick 4 Grip X-Axis Lever Left Negative Position Status       | 4514 |
| 1.5            | 2 bits  | Joystick 4 Grip X-Axis Lever Right Positive Position Status      | 4515 |
| 1.7-2          | 10 bits | Joystick 4 Grip X-Axis Position                                  | 4516 |
| 3.1            | 2 bits  | Joystick 4 Grip Y-Axis Neutral Position Status                   | 4517 |
| 3.3            | 2 bits  | Joystick 4 Grip Y-Axis Lever Back Negative Position Status       | 4518 |
| 3.5            | 2 bits  | Joystick 4 Grip Y-Axis Lever Forward Positive Position Status    | 4519 |
| 3.7-4          | 10 bits | Joystick 4 Grip Y-Axis Position                                  | 4520 |
| 5.1            | 2 bits  | Joystick 4 Theta-Axis Neutral Position Status                    | 4521 |
| 5.3            | 2 bits  | Joystick 4 Theta-Axis Counter Clockwise Negative Position Status | 4522 |
| 5.5            | 2 bits  | Joystick 4 Theta-Axis Clockwise Positive Position Status         | 4523 |
| 5.7-6          | 10 bits | Joystick 4 Theta-Axis Position                                   | 4524 |
| 7.3            | 2 bits  | Joystick 4 Theta-Axis Detent Position Status                     | 4525 |
| 7.5            | 2 bits  | Joystick 4 Grip Y-Axis Detent Position Status                    | 4526 |
| 7.7            | 2 bits  | Joystick 4 Grip X-Axis Detent Position Status                    | 4527 |

**PGN 64816****Basic Joystick Message 4****BJM4**

Used to transfer information about the measured status of the 1st 2 axes and up to 12 buttons of a joystick. Additional handle information is available in the Expanded Joystick Message.

10-bit position parameters are broadcast over 2 bytes. The eight most significant bits are transmitted in the second byte, with the most significant bit at bit 8. The two least significant bits are transmitted in the first byte in bit positions 7 and 8, with the most significant of the two bits at bit 8.

| 10-bit position SPN | Location in PGN |       |
|---------------------|-----------------|-------|
| Bit 10              | Byte n          | Bit 8 |
| Bit 9               |                 | Bit 7 |
| Bit 8               |                 | Bit 6 |
| Bit 7               |                 | Bit 5 |
| Bit 6               |                 | Bit 4 |
| Bit 5               |                 | Bit 3 |
| Bit 4               |                 | Bit 2 |
| Bit 3               |                 | Bit 1 |
| Bit 2               | Byte (n-1)      | Bit 8 |
| Bit 1               |                 | Bit 7 |

|                               |                                                                                                                                                                                                                                 |                             |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| Transmission Repetition Rate: | Every 100 ms and on change of state, but no faster than every 20 ms. Grandfathered definition for systems that implemented this message prior to July, 2010: Every 100 ms or on change of state, but no faster than every 20 ms |                             |
| Data Length:                  | 8                                                                                                                                                                                                                               |                             |
| Extended Data Page:           | 0                                                                                                                                                                                                                               |                             |
| Data Page:                    | 0                                                                                                                                                                                                                               |                             |
| PDU Format:                   | 253                                                                                                                                                                                                                             |                             |
| PDU Specific:                 | 48                                                                                                                                                                                                                              | PGN Supporting Information: |
| Default Priority:             | 3                                                                                                                                                                                                                               |                             |
| Parameter Group Number:       | 64816 (0x00FD30)                                                                                                                                                                                                                |                             |

| Start Position | Length  | Parameter Name                                           | SPN  |
|----------------|---------|----------------------------------------------------------|------|
| 1.1            | 2 bits  | Joystick 4 X-Axis Neutral Position Status                | 4491 |
| 1.3            | 2 bits  | Joystick 4 X-Axis Lever Left Negative Position Status    | 4492 |
| 1.5            | 2 bits  | Joystick 4 X-Axis Lever Right Positive Position Status   | 4493 |
| 1.7-2          | 10 bits | Joystick 4 X-Axis Position                               | 4494 |
| 3.1            | 2 bits  | Joystick 4 Y-Axis Neutral Position Status                | 4495 |
| 3.3            | 2 bits  | Joystick 4 Y-Axis Lever Back Negative Position Status    | 4496 |
| 3.5            | 2 bits  | Joystick 4 Y-Axis Lever Forward Positive Position Status | 4497 |
| 3.7-4          | 10 bits | Joystick 4 Y-Axis Position                               | 4498 |
| 5.5            | 2 bits  | Joystick 4 Y-Axis Detent Position Status                 | 4499 |
| 5.7            | 2 bits  | Joystick 4 X-Axis Detent Position Status                 | 4500 |
| 6.1            | 2 bits  | Joystick 4 Button 4 Pressed Status                       | 4501 |
| 6.3            | 2 bits  | Joystick 4 Button 3 Pressed Status                       | 4502 |
| 6.5            | 2 bits  | Joystick 4 Button 2 Pressed Status                       | 4503 |
| 6.7            | 2 bits  | Joystick 4 Button 1 Pressed Status                       | 4504 |
| 7.1            | 2 bits  | Joystick 4 Button 8 Pressed Status                       | 4505 |
| 7.3            | 2 bits  | Joystick 4 Button 7 Pressed Status                       | 4506 |
| 7.5            | 2 bits  | Joystick 4 Button 6 Pressed Status                       | 4507 |
| 7.7            | 2 bits  | Joystick 4 Button 5 Pressed Status                       | 4508 |
| 8.1            | 2 bits  | Joystick 4 Button 12 Pressed Status                      | 4509 |
| 8.3            | 2 bits  | Joystick 4 Button 11 Pressed Status                      | 4510 |
| 8.5            | 2 bits  | Joystick 4 Button 10 Pressed Status                      | 4511 |
| 8.7            | 2 bits  | Joystick 4 Button 9 Pressed Status                       | 4512 |

**(R) PGN 64819      Aftertreatment 2 SCR Reagent Supply Information****A2SCRRSI**

This message contains SCR reagent supply information for aftertreatment system 2 (or bank 2).

Transmission Repetition Rate: 1 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 51                      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64819 (0x00FD33)

| Start Position | Length  | Parameter Name                                              | SPN  |
|----------------|---------|-------------------------------------------------------------|------|
| 1-2            | 2 bytes | Aftertreatment 2 SCR Catalyst Reagent Pump Motor Speed      | 4440 |
| 3              | 1 byte  | Aftertreatment 2 SCR Catalyst Reagent Pump Drive Percentage | 4441 |
| 4              | 1 byte  | Aftertreatment 2 SCR Catalyst Reagent Return Valve          | 4442 |
| 5              | 1 byte  | Aftertreatment 2 SCR Catalyst Reagent Tank Fill Valve       | 5437 |
|                |         | Command                                                     |      |
| 6.1            | 2 bits  | Aftertreatment 2 SCR Catalyst Reagent Pump State            | 5438 |
| 7              | 1 byte  | Aftertreatment 2 SCR Catalyst Reagent Tank Drain Valve      | 5439 |
|                |         | Command                                                     |      |

**PGN 64820      Aftertreatment 2 SCR Reagent Tank 2 Information****A2SCRRT2I**

This message contains SCR reagent tank 2 information for aftertreatment system 2 (or bank 2). The second tank for the aftertreatment system is usually a smaller quick-thaw reagent tank located in series with tank 1.

Transmission Repetition Rate: 1 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 52                      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64820 (0x00FD34)

| Start Position | Length  | Parameter Name                                                 | SPN  |
|----------------|---------|----------------------------------------------------------------|------|
| 1              | 1 byte  | Aftertreatment 2 SCR Catalyst Reagent Tank 2 Level             | 4433 |
| 2              | 1 byte  | Aftertreatment 2 SCR Catalyst Reagent Tank 2 Temperature       | 4434 |
| 3-4            | 2 bytes | Aftertreatment 2 SCR Catalyst Reagent Tank 2 Level 2           | 4435 |
| 5.1            | 5 bits  | Aftertreatment 2 SCR Catalyst Reagent Tank 2 Level Preliminary | 4436 |
|                |         | FMI                                                            |      |
| 6.1            | 5 bits  | Aftertreatment 2 SCR Reagent Tank 2 Temperature Preliminary    | 4437 |
|                |         | FMI                                                            |      |
| 7              | 4 bits  | Aftertreatment 2 SCR Catalyst Reagent Tank 2 Heater            | 4438 |
| 8.1            | 5 bits  | Aftertreatment 2 SCR Catalyst Reagent Tank 2 Heater            | 4439 |
|                |         | Preliminary FMI                                                |      |



**PGN 64821      Aftertreatment 2 SCR Reagent Tank 1 Information****A2SCRRT1I**

This message contains SCR reagent tank 1 information for aftertreatment system 2 (or bank 2). The first tank for the aftertreatment system is primary reagent storage tank.

Transmission Repetition Rate: 1 s  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 53      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64821 (0x00FD35)

| Start Position | Length  | Parameter Name                                                           | SPN  |
|----------------|---------|--------------------------------------------------------------------------|------|
| 1              | 1 byte  | Aftertreatment 2 SCR Catalyst Tank Level                                 | 4426 |
| 2              | 1 byte  | Aftertreatment 2 SCR Catalyst Tank Temperature                           | 4427 |
| 3-4            | 2 bytes | Aftertreatment 2 SCR Catalyst Tank Level 2                               | 4428 |
| 5.1            | 5 bits  | Aftertreatment 2 SCR Catalyst Tank Level Preliminary FMI                 | 4429 |
| 6.1            | 5 bits  | Aftertreatment 2 SCR Catalyst Reagent Tank 1 Temperature Preliminary FMI | 4430 |
| 7              | 1 byte  | Aftertreatment 2 SCR Catalyst Tank Heater                                | 4431 |
| 8.1            | 5 bits  | Aftertreatment 2 SCR Catalyst Reagent Tank 1 Heater Preliminary FMI      | 4432 |

**PGN 64822      Aftertreatment 2 SCR Reagent Information****A2SCRRI**

Sensor Information which measures temperature, concentration, and conductivity of the catalyst reagent of the aftertreatment 2 system.

Transmission Repetition Rate: 1 s  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 54      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64822 (0x00FD36)

| Start Position | Length | Parameter Name                                                      | SPN  |
|----------------|--------|---------------------------------------------------------------------|------|
| 1              | 1 byte | Aftertreatment 2 SCR Catalyst Reagent Temperature 2                 | 4420 |
| 2              | 1 byte | Aftertreatment 2 SCR Catalyst Reagent Concentration                 | 4421 |
| 3              | 1 byte | Aftertreatment 2 SCR Catalyst Reagent Conductivity                  | 4422 |
| 4.1            | 5 bits | Aftertreatment 2 SCR Catalyst Reagent Temperature 2 Preliminary FMI | 4423 |
| 5.1            | 5 bits | Aftertreatment 2 SCR Catalyst Reagent Properties Preliminary FMI    | 4424 |
| 6.1            | 4 bits | Aftertreatment 2 SCR Catalyst Reagent Type                          | 4425 |

**PGN 64823      Aftertreatment 2 SCR Service Information****A2SCRSI**

This message contains SCR service information for aftertreatment system 2 (or bank 2).

Transmission Repetition Rate:      On request  
Data Length:                              8  
Extended Data Page:                      0  
Data Page:                                  0  
PDU Format:                                253  
PDU Specific:                              55                      PGN Supporting Information:  
Default Priority:                          8  
Parameter Group Number:                64823 (0x00FD37)

| Start Position | Length  | Parameter Name                                              | SPN  |
|----------------|---------|-------------------------------------------------------------|------|
| 1-2            | 2 bytes | Aftertreatment 2 SCR Average Catalyst Reagent Consumption   | 4417 |
| 3-4            | 2 bytes | Aftertreatment 2 SCR Commanded Catalyst Reagent Consumption | 4418 |
| 5              | 1 byte  | Aftertreatment 2 SCR Catalyst Conversion Efficiency         | 4419 |

**PGN 64824      Aftertreatment 2 SCR Exhaust Gas Temperature****A2SCREGT**

This message contains SCR catalyst intake and outlet exhaust gas temperature information for aftertreatment system 2 (or bank 2).

Transmission Repetition Rate:      500 ms  
Data Length:                              8  
Extended Data Page:                      0  
Data Page:                                  0  
PDU Format:                                253  
PDU Specific:                              56                      PGN Supporting Information:  
Default Priority:                          6  
Parameter Group Number:                64824 (0x00FD38)

| Start Position | Length  | Parameter Name                                                       | SPN  |
|----------------|---------|----------------------------------------------------------------------|------|
| 1-2            | 2 bytes | Aftertreatment 2 SCR Catalyst Intake Gas Temperature                 | 4413 |
| 3.1            | 5 bits  | Aftertreatment 2 SCR Catalyst Intake Gas Temperature Preliminary FMI | 4414 |
| 4-5            | 2 bytes | Aftertreatment 2 SCR Catalyst Outlet Gas Temperature                 | 4415 |
| 6.1            | 5 bits  | Aftertreatment 2 SCR Catalyst Outlet Gas Temperature Preliminary FMI | 4416 |

**PGN 64825      Aftertreatment 2 SCR Exhaust Gas Pressures****A2SCREGP**

This message contains SCR catalyst exhaust gas pressure information for aftertreatment system 2 (or bank 2).

Transmission Repetition Rate: 500 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 57      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64825 (0x00FD39)

| Start Position | Length  | Parameter Name                                                  | SPN  |
|----------------|---------|-----------------------------------------------------------------|------|
| 1-2            | 2 bytes | Aftertreatment 2 SCR Catalyst Exhaust Gas Differential Pressure | 4411 |
| 3.1            | 5 bits  | Aftertreatment 2 SCR Catalyst Exhaust Gas Differential Pressure | 4412 |
|                |         | Preliminary FMI                                                 |      |

**(R) PGN 64826      Aftertreatment 2 SCR Dosing System Requests 2****A2SCRDSR2**

This message contains SCR dosing system request information for aftertreatment system 2 (or bank 2).

Transmission Repetition Rate: 500 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 58      PGN Supporting Information:  
 Default Priority:  
 Parameter Group Number: 64826 (0x00FD3A)

| Start Position | Length | Parameter Name                                       | SPN  |
|----------------|--------|------------------------------------------------------|------|
| 1.3            | 2 bits | Aftertreatment 2 SCR Doser Fault Suppression Request | 4405 |
| 1.5            | 3 bits | Aftertreatment 2 SCR Doser Heating Mode Request      | 4406 |
| 2.1            | 2 bits | Aftertreatment 2 SCR Catalyst Reagent Line Heater 1  | 4407 |
| 2.3            | 2 bits | Aftertreatment 2 SCR Catalyst Reagent Line Heater 2  | 4408 |
| 2.5            | 2 bits | Aftertreatment 2 SCR Catalyst Reagent Line Heater 3  | 4409 |
| 2.7            | 2 bits | Aftertreatment 2 SCR Catalyst Reagent Line Heater 4  | 4410 |
| 3              | 1 byte | Aftertreatment 2 SCR Catalyst Tank Heater Command    | 5138 |
| 4              | 1 byte | Aftertreatment 2 SCR Catalyst Tank 2 Heater Command  | 5415 |

**PGN 64827      Aftertreatment 2 SCR Dosing System Information 2****A2SCRDSI2**

This message contains SCR dosing system information for aftertreatment system 2 (or bank 2). See PGN 61478 for more information.

Transmission Repetition Rate: 500 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 59      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64827 (0x00FD3B)

| Start Position | Length | Parameter Name                                                      | SPN  |
|----------------|--------|---------------------------------------------------------------------|------|
| 1              | 1 byte | Aftertreatment 2 SCR Dosing Air Assist Absolute Pressure            | 4388 |
| 2              | 1 byte | Aftertreatment 2 SCR Dosing Air Assist Valve                        | 4389 |
| 3              | 1 byte | Aftertreatment 2 SCR Dosing Reagent Temperature                     | 4390 |
| 4.1            | 3 bits | Aftertreatment 2 SCR Dosing Valve Exhaust Temp. Reduction Request   | 4391 |
| 4.4            | 3 bits | Aftertreatment 2 SCR Feedback Control Status                        | 4392 |
| 5.1            | 2 bits | Aftertreatment 2 SCR Catalyst Reagent Line Heater 1 state           | 4393 |
| 5.3            | 5 bits | Aftertreatment 2 SCR Catalyst Reagent Line Heater 1 Preliminary FMI | 4394 |
| 6.1            | 2 bits | Aftertreatment 2 SCR Catalyst Reagent Line Heater 2 state           | 4395 |
| 6.3            | 5 bits | Aftertreatment 2 SCR Catalyst Reagent Line Heater 2 Preliminary FMI | 4396 |
| 7.1            | 2 bits | Aftertreatment 2 SCR Catalyst Reagent Line Heater 3 state           | 4397 |
| 7.3            | 5 bits | Aftertreatment 2 SCR Catalyst Reagent Line Heater 3 Preliminary FMI | 4398 |
| 8.1            | 2 bits | Aftertreatment 2 SCR Catalyst Reagent Line Heater 4 state           | 4399 |
| 8.3            | 5 bits | Aftertreatment 2 SCR Catalyst Reagent Line Heater 4 Preliminary FMI | 4400 |

**(R) PGN 64828      Aftertreatment 1 SCR Reagent Supply Information****A1SCRRSI**

This message contains SCR reagent supply information for aftertreatment system 1 (or bank 1).

Transmission Repetition Rate: 1 s  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 60      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64828 (0x00FD3C)

| Start Position | Length  | Parameter Name                                                 | SPN  |
|----------------|---------|----------------------------------------------------------------|------|
| 1-2            | 2 bytes | Aftertreatment 1 SCR Catalyst Reagent Pump Motor Speed         | 4374 |
| 3              | 1 byte  | Aftertreatment 1 SCR Catalyst Reagent Pump Drive Percentage    | 4375 |
| 4              | 1 byte  | Aftertreatment 1 SCR Catalyst Reagent Return Valve             | 4376 |
| 5              | 1 byte  | Aftertreatment 1 SCR Catalyst Reagent Tank Fill Valve Command  | 5434 |
| 6.1            | 2 bits  | Aftertreatment 1 SCR Catalyst Reagent Pump State               | 5435 |
| 7              | 1 byte  | Aftertreatment 1 SCR Catalyst Reagent Tank Drain Valve Command | 5436 |

**PGN 64829      Aftertreatment 1 SCR Reagent Tank 2 Information****A1SCRRT2I**

This message contains SCR reagent tank 2 information for aftertreatment system 1 (or bank 1). The second tank for the aftertreatment system is usually a smaller quick-thaw reagent tank located in series with tank 1.

Transmission Repetition Rate: 1 s  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 61      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64829 (0x00FD3D)

| Start Position | Length  | Parameter Name                                                      | SPN  |
|----------------|---------|---------------------------------------------------------------------|------|
| 1              | 1 byte  | Aftertreatment 1 SCR Catalyst Reagent Tank 2 Level                  | 4367 |
| 2              | 1 byte  | Aftertreatment 1 SCR Catalyst Reagent Tank 2 Temperature            | 4368 |
| 3-4            | 2 bytes | Aftertreatment 1 SCR Catalyst Reagent Tank 2 Level 2                | 4369 |
| 5.1            | 5 bits  | Aftertreatment 1 SCR Catalyst Reagent Tank 2 Level Preliminary FMI  | 4370 |
| 6.1            | 5 bits  | Aftertreatment 1 SCR Reagent Tank 2 Temperature Preliminary FMI     | 4371 |
| 7              | 1 byte  | Aftertreatment 1 SCR Catalyst Reagent Tank 2 Heater                 | 4372 |
| 8.1            | 5 bits  | Aftertreatment 1 SCR Catalyst Reagent Tank 2 Heater Preliminary FMI | 4373 |

**PGN 64830      Aftertreatment 1 SCR Exhaust Gas Temperature****A1SCREGT**

This message contains SCR catalyst intake and outlet exhaust gas temperature information for aftertreatment system 1 (or bank 1).

Transmission Repetition Rate: 500 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 62      PGN Supporting Information:  
 Default Priority: 5  
 Parameter Group Number: 64830 (0x00FD3E)

| Start Position | Length  | Parameter Name                                                       | SPN  |
|----------------|---------|----------------------------------------------------------------------|------|
| 1-2            | 2 bytes | Aftertreatment 1 SCR Catalyst Intake Gas Temperature                 | 4360 |
| 3.1            | 5 bits  | Aftertreatment 1 SCR Catalyst Intake Gas Temperature Preliminary FMI | 4361 |
| 4-5            | 2 bytes | Aftertreatment 1 SCR Catalyst Outlet Gas Temperature                 | 4363 |
| 6.1            | 5 bits  | Aftertreatment 1 SCR Catalyst Outlet Gas Temperature Preliminary FMI | 4362 |

**PGN 64831      Aftertreatment 1 SCR Exhaust Gas Pressures****A1SCREGP**

This message contains SCR catalyst exhaust gas pressure information for aftertreatment system 1 (or bank 1).

Transmission Repetition Rate: 500 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 63      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64831 (0x00FD3F)

| Start Position | Length  | Parameter Name                                                  | SPN  |
|----------------|---------|-----------------------------------------------------------------|------|
| 1-2            | 2 bytes | Aftertreatment 1 SCR Catalyst Exhaust Gas Differential Pressure | 4358 |
| 3.1            | 5 bits  | Aftertreatment 1 SCR Catalyst Exhaust Gas Differential Pressure | 4359 |
|                |         | Preliminary FMI                                                 |      |

**(R) PGN 64832      Aftertreatment 1 SCR Dosing System Requests 2****A1SCRDSR2**

This message contains SCR dosing system request information for aftertreatment system 1 (or bank 1). See PGN 61476 for more information.

Transmission Repetition Rate: 500 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 64      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64832 (0x00FD40)

| Start Position | Length | Parameter Name                                       | SPN  |
|----------------|--------|------------------------------------------------------|------|
| 1.3            | 2 bits | Aftertreatment 1 SCR Doser Fault Suppression Request | 4352 |
| 1.5            | 3 bits | Aftertreatment 1 SCR Doser Heating Mode Request      | 4353 |
| 2.1            | 2 bits | Aftertreatment 1 SCR Catalyst Reagent Line Heater 1  | 4354 |
| 2.3            | 2 bits | Aftertreatment 1 SCR Catalyst Reagent Line Heater 2  | 4355 |
| 2.5            | 2 bits | Aftertreatment 1 SCR Catalyst Reagent Line Heater 3  | 4356 |
| 2.7            | 2 bits | Aftertreatment 1 SCR Catalyst Reagent Line Heater 4  | 4357 |
| 3              | 1 byte | Aftertreatment 1 SCR Catalyst Tank Heater Command    | 5137 |
| 4              | 1 byte | Aftertreatment 1 SCR Catalyst Tank 2 Heater Command  | 5414 |

**PGN 64833****Aftertreatment 1 SCR Dosing System Information 2****A1SCRDSI2**

This message contains SCR dosing system information for aftertreatment system 1 (or bank 1). See PGN 61475 for more information.

Transmission Repetition Rate: 500 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 65 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64833 (0x00FD41)

| Start Position | Length | Parameter Name                                                      | SPN  |
|----------------|--------|---------------------------------------------------------------------|------|
| 1              | 1 byte | Aftertreatment 1 SCR Dosing Air Assist Absolute Pressure            | 4335 |
| 2              | 1 byte | Aftertreatment 1 SCR Dosing Air Assist Valve                        | 4336 |
| 3              | 1 byte | Aftertreatment 1 SCR Dosing Reagent Temperature                     | 4337 |
| 4.1            | 3 bits | Aftertreatment 1 SCR Dosing Valve Exhaust Temp. Reduction Request   | 4338 |
| 4.4            | 3 bits | Aftertreatment 1 SCR Feedback Control Status                        | 4339 |
| 5.1            | 2 bits | Aftertreatment 1 SCR Catalyst Reagent Line Heater 1 state           | 4340 |
| 5.3            | 5 bits | Aftertreatment 1 SCR Catalyst Reagent Line Heater 1 Preliminary FMI | 4341 |
| 6.1            | 2 bits | Aftertreatment 1 SCR Catalyst Reagent Line Heater 2 state           | 4342 |
| 6.3            | 5 bits | Aftertreatment 1 SCR Catalyst Reagent Line Heater 2 Preliminary FMI | 4343 |
| 7.1            | 2 bits | Aftertreatment 1 SCR Catalyst Reagent Line Heater 3 state           | 4344 |
| 7.3            | 5 bits | Aftertreatment 1 SCR Catalyst Reagent Line Heater 3 Preliminary FMI | 4345 |
| 8.1            | 2 bits | Aftertreatment 1 SCR Catalyst Reagent Line Heater 4 state           | 4346 |
| 8.3            | 5 bits | Aftertreatment 1 SCR Catalyst Reagent Line Heater 4 Preliminary FMI | 4347 |

**(R) PGN 64836****Aftertreatment 2 Fuel Control 2****AT2FC2**

Contains information about the aftertreatment 2 fuel system. See also PGN 64928.

Transmission Repetition Rate: 500 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 68 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64836 (0x00FD44)

| Start Position | Length  | Parameter Name                                    | SPN  |
|----------------|---------|---------------------------------------------------|------|
| 1-2            | 2 bytes | Aftertreatment 2 Fuel Pressure 2                  | 4303 |
| 3.1            | 2 bits  | Aftertreatment 2 Fuel Pump Relay Control          | 5426 |
| 3.3            | 2 bits  | Aftertreatment 2 Fuel Flow Diverter Valve Control | 5427 |
| 4-5            | 2 bytes | Aftertreatment 2 Fuel Pressure 2 Control          | 5428 |

**(R) PGN 64837     Aftertreatment 2 Three Way Catalytic Converter****AT2TWCC**

The purpose of this PGN is to group the aftertreatment Three Way Catalytic Converter data for bank 2. These values include the intake temperature, outlet temperature and differential pressure as well as the associated preliminary FMIs.

Note: The 5 bits of SPN 4299 are positioned into the data field in the following manner. The 2 most significant bits are placed in bits 2-1 of byte 8 such that the most significant bit of SPN 4299 located at byte 8 bit 2, and the 3 least significant bits are placed in bits 8-6 of byte 7 such that the least significant bit of SPN 4299 located at byte 7 bit 6.

Transmission Repetition Rate: 500 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 69                      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64837 (0x00FD45)

| Start Position | Length  | Parameter Name                                                                        | SPN  |
|----------------|---------|---------------------------------------------------------------------------------------|------|
| 1-2            | 2 bytes | Aftertreatment 2 Three Way Catalytic Converter Intake Gas Temperature                 | 4295 |
| 3-4            | 2 bytes | Aftertreatment 2 Three Way Catalytic Converter Outlet Gas Temperature                 | 4296 |
| 5-6            | 2 bytes | Aftertreatment 2 Three Way Catalytic Converter Differential Pressure                  | 4297 |
| 7.1            | 5 bits  | Aftertreatment 2 Three Way Catalytic Converter Intake Gas Temperature Preliminary FMI | 4298 |
| 7.6-8.1        | 5 bits  | Aftertreatment 2 Three Way Catalytic Converter Outlet Gas Temperature Preliminary FMI | 4299 |
| 8.3            | 5 bits  | Aftertreatment 2 Three Way Catalytic Converter Differential Pressure Preliminary FMI  | 4300 |



**(R) PGN 64838      Aftertreatment 1 Three Way Catalytic Converter****AT1TWCC**

The purpose of this PGN is to group the aftertreatment Three Way Catalytic Converter data for bank 1. These values include the intake temperature, outlet temperature and differential pressure as well as the associated preliminary FMIs.

Note: The 5 bits of SPN 4293 are positioned into the data field in the following manner. The 2 most significant bits are placed in bits 2-1 of byte 8 such that the most significant bit of SPN 4293 located at byte 8 bit 2, and the 3 least significant bits are placed in bits 8-6 of byte 7 such that the least significant bit of SPN 4293 located at byte 7 bit 6.

Transmission Repetition Rate: 500 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 70      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64838 (0x00FD46)

| Start Position | Length  | Parameter Name                                                                        | SPN  |
|----------------|---------|---------------------------------------------------------------------------------------|------|
| 1-2            | 2 bytes | Aftertreatment 1 Three Way Catalytic Converter Intake Gas Temperature                 | 4289 |
| 3-4            | 2 bytes | Aftertreatment 1 Three Way Catalytic Converter Outlet Gas Temperature                 | 4290 |
| 5-6            | 2 bytes | Aftertreatment 1 Three Way Catalytic Converter Differential Pressure                  | 4291 |
| 7.1            | 5 bits  | Aftertreatment 1 Three Way Catalytic Converter Intake Gas Temperature Preliminary FMI | 4292 |
| 7.6-8.1        | 5 bits  | Aftertreatment 1 Three Way Catalytic Converter Outlet Gas Temperature Preliminary FMI | 4293 |
| 8.3            | 5 bits  | Aftertreatment 1 Three Way Catalytic Converter Differential Pressure Preliminary FMI  | 4294 |

**(R) PGN 64839      Transmission Mode Labels****TML**

ASCII text string describing a manufacturer-specific Transmission Mode. This PGN may contain up to 8 instances of the Transmission Mode Label field (for Transmission Mode 1 through Transmission Mode 8) with each separated by the asterisk (\*) delimiter character. The Mode Labels are placed in increasing order of the mode number (i.e. Mode 1 label is first, followed by Mode 2 label, etc). It is not necessary to include text for each mode; however, the delimiter is always required for each, i.e. the data field must include all 8 asterisk delimiters even if the application does not provide label data for each of the modes.

NOTE – The ASCII character “\*” is reserved as the delimiter

Transmission Repetition Rate: On request  
 Data Length: Variable  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 71      PGN Supporting Information: See Appendix D - PGN 64839  
 Default Priority: 7  
 Parameter Group Number: 64839 (0x00FD47)

| Start Position | Length                                                 | Parameter Name          | SPN  |
|----------------|--------------------------------------------------------|-------------------------|------|
| A              | Variable - up to 25 bytes followed by an “*” delimiter | Transmission Mode Label | 4254 |

**PGN 64840 Engine Exhaust Bank 2 O2 Fuel Trim****O2FT2**

Provides bank 2 short-term and long-term fuel trim values

Transmission Repetition Rate: On Request  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 72 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64840 (0x00FD48)

| Start Position | Length  | Parameter Name                                                 | SPN  |
|----------------|---------|----------------------------------------------------------------|------|
| 1-2            | 2 bytes | Long-term Fuel Trim - Bank 2                                   | 4239 |
| 3-4            | 2 bytes | Short-term Fuel Trim - Bank 2                                  | 4238 |
| 5.1            | 4 bits  | Engine Exhaust Gas Oxygen Sensor Closed Loop Operation, Bank 2 | 4241 |

**PGN 64841 Engine Exhaust Bank 1 O2 Fuel Trim****O2FT1**

Provides bank 1 short-term and long-term fuel trim values

Transmission Repetition Rate: On Request  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 73 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64841 (0x00FD49)

| Start Position | Length  | Parameter Name                                                 | SPN  |
|----------------|---------|----------------------------------------------------------------|------|
| 1-2            | 2 bytes | Long-term Fuel Trim - Bank 1                                   | 4237 |
| 3-4            | 2 bytes | Short-term Fuel Trim - Bank 1                                  | 4236 |
| 5.1            | 4 bits  | Engine Exhaust Gas Oxygen Sensor Closed Loop Operation, Bank 1 | 4240 |

**PGN 64849 Aftercooler Coolant Control Valve Command****ACCVC**

Transmit status information from the Master ECU to an electronic thermostat

Transmission Repetition Rate: 1 sec  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 81 PGN Supporting Information:  
 Default Priority: 4  
 Parameter Group Number: 64849 (0x00FD51)

| Start Position | Length | Parameter Name                                 | SPN  |
|----------------|--------|------------------------------------------------|------|
| 1.1            | 2 bits | Aftercooler Coolant Thermostat Mode            | 4198 |
| 2              | 1 byte | Desired Aftercooler Coolant Intake Temperature | 4199 |
| 3              | 1 byte | Desired Aftercooler Coolant Thermostat Opening | 4200 |

**PGN 64850 Engine Coolant Control Valve Command****ECCVC**

Transmit status information from the Master ECU to an electronic thermostat

Transmission Repetition Rate: 1 sec  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 82 PGN Supporting Information:  
 Default Priority: 4  
 Parameter Group Number: 64850 (0x00FD52)

| Start Position | Length | Parameter Name                                 | SPN  |
|----------------|--------|------------------------------------------------|------|
| 1.1            | 2 bits | Engine Coolant Thermostat Mode                 | 4195 |
| 2              | 1 byte | Desired Engine Coolant Pump Outlet Temperature | 4196 |
| 3              | 1 byte | Desired Engine Coolant Thermostat Opening      | 4197 |

**PGN 64851 Engine Average Information****EAI**

Reports averaged engine information

Transmission Repetition Rate: 500 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 83 PGN Supporting Information:  
 Default Priority: 5  
 Parameter Group Number: 64851 (0x00FD53)

| Start Position | Length  | Parameter Name                                  | SPN  |
|----------------|---------|-------------------------------------------------|------|
| 1-2            | 2 bytes | Engine Exhaust Gas Temperature Average          | 4151 |
| 3-4            | 2 bytes | Engine Exhaust Gas Temperature Average - Bank 1 | 4153 |
| 5-6            | 2 bytes | Engine Exhaust Gas Temperature Average - Bank 2 | 4152 |

**(R) PGN 64869 Aftertreatment 1 Fuel Control 2****AT1FC2**

Contains information about the aftertreatment 1 fuel system. See also PGN 64929.

Transmission Repetition Rate: 500 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 101 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64869 (0x00FD65)

| Start Position | Length  | Parameter Name                                             | SPN  |
|----------------|---------|------------------------------------------------------------|------|
| 1-2            | 2 bytes | Aftertreatment 1 Fuel Pressure 2                           | 4077 |
| 3.1            | 2 bits  | Aftertreatment 1 Fuel Pump Relay Control                   | 5423 |
| 3.3            | 2 bits  | Aftertreatment 1 Fuel Flow Diverter Valve Control          | 5424 |
| 4-5            | 2 bytes | Aftertreatment 1 Fuel Pressure 2 Actuator Control          | 5425 |
| 6              | 1 byte  | Aftertreatment 1 Hydrocarbon Doser Intake Fuel Temperature | 5456 |

**PGN 64870 Engine Temperature 4****ET4**

Engine temperatures

Transmission Repetition Rate: 1 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 102 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64870 (0x00FD66)

| Start Position | Length  | Parameter Name                                              | SPN  |
|----------------|---------|-------------------------------------------------------------|------|
| 1              | 1 byte  | Engine Coolant Temperature 2                                | 4076 |
| 2              | 1 byte  | Engine Coolant Pump Outlet Temperature                      | 4193 |
| 3              | 1 byte  | Engine Coolant Thermostat Opening                           | 4194 |
| 4-5            | 2 bytes | Engine Exhaust Valve Actuation System Oil Temperature       | 4288 |
| 6-7            | 2 bytes | Engine Exhaust Gas Recirculation 1 Mixer Intake Temperature | 5020 |

**PGN 64871 Zero Net Vehicle Weight Change****ZNWV**

Zero Net Vehicle Weight Change

Transmission Repetition Rate: As needed  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 103 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64871 (0x00FD67)

| Start Position | Length | Parameter Name                 | SPN  |
|----------------|--------|--------------------------------|------|
| 1.1            | 2 bits | Zero Net Vehicle Weight Change | 4075 |

**PGN 64872 Gross Combination Vehicle Weight****GCVW**

Gross Combination Vehicle Weight

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 104 PGN Supporting Information:  
Default Priority: 5  
Parameter Group Number: 64872 (0x00FD68)

| Start Position | Length  | Parameter Name            | SPN |
|----------------|---------|---------------------------|-----|
| 1-3            | 3 bytes | Gross Combination Weight  | 417 |
| 4-6            | 3 bytes | Net Vehicle Weight Change | 413 |

**PGN 64873      Axle Group Calibration Weights****AGCW**

Indicates axle group calibration weights

Transmission Repetition Rate: On request. Upon request, will be broadcast as many times as required to transmit all available axle groups.

Data Length: 8

Extended Data Page: 0

Data Page: 0

PDU Format: 253

PDU Specific: 105      PGN Supporting Information:

Default Priority: 7

Parameter Group Number: 64873 (0x00FD69)

| Start Position | Length  | Parameter Name                      | SPN  |
|----------------|---------|-------------------------------------|------|
| 1.1            | 4 bits  | Axle Group Location                 | 4074 |
| 2-3            | 2 bytes | Axle Group Empty Weight Calibration | 408  |
| 4-5            | 2 bytes | Axle Group Full Weight Calibration  | 407  |

**PGN 64874      Axle Group Weight****AGW**

Combination of specific axle group and the weight imposed on that axle group

Transmission Repetition Rate: On request. Upon request, will be broadcast as many times as required to transmit all available axle groups.

Data Length: 8

Extended Data Page: 0

Data Page: 0

PDU Format: 253

PDU Specific: 106      PGN Supporting Information:

Default Priority: 5

Parameter Group Number: 64874 (0x00FD6A)

| Start Position | Length  | Parameter Name      | SPN  |
|----------------|---------|---------------------|------|
| 1.1            | 4 bits  | Axle Group Location | 4073 |
| 2-3            | 2 bytes | Axle Group Weight   | 409  |

**PGN 64875      Available Axle Group Weights****AAGW**

Indicates which axle groups are included in the current weight calculation

Transmission Repetition Rate: As needed. Broadcast whenever an axle group equipped with an on-board scale joined or left the on-board scale subset.

Data Length: 8

Extended Data Page: 0

Data Page: 0

PDU Format: 253

PDU Specific: 107      PGN Supporting Information:

Default Priority: 6

Parameter Group Number: 64875 (0x00FD6B)

| Start Position | Length | Parameter Name                                 | SPN  |
|----------------|--------|------------------------------------------------|------|
| 1.1            | 2 bits | Steer Axle Group Weight Available              | 4059 |
| 1.3            | 2 bits | Lift Axle Group Weight Available               | 4060 |
| 1.5            | 2 bits | Drive Axle Group Weight Available              | 4061 |
| 1.7            | 2 bits | Tag Axle Group Weight Available                | 4062 |
| 2.1            | 2 bits | Additional Tractor Axle Group Weight Available | 4063 |

|     |        |                                                |      |
|-----|--------|------------------------------------------------|------|
| 2.3 | 2 bits | Trailer A Axle Group Weight Available          | 4064 |
| 2.5 | 2 bits | Trailer B Axle Group Weight Available          | 4065 |
| 2.7 | 2 bits | Trailer C Axle Group Weight Available          | 4066 |
| 3.1 | 2 bits | Trailer D Axle Group Weight Available          | 4067 |
| 3.3 | 2 bits | Trailer E Axle Group Weight Available          | 4068 |
| 3.5 | 2 bits | Trailer F Axle Group Weight Available          | 4069 |
| 3.7 | 2 bits | Trailer G Axle Group Weight Available          | 4070 |
| 4.1 | 2 bits | Trailer H Axle Group Weight Available          | 4071 |
| 4.3 | 2 bits | Additional Trailer Axle Group Weight Available | 4072 |

**PGN 64876      Aftertreatment 2 Air Control 2****AT2AC2**

This PGN contains information about the Aftertreatment 2 Air Control.

NOTE: This message will be transmitted by the engine or aftertreatment controller. Other aftertreatment air control information could be added in the future.

Transmission Repetition Rate: 500 msec  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 108      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64876 (0x00FD6C)

| Start Position | Length  | Parameter Name                                       | SPN  |
|----------------|---------|------------------------------------------------------|------|
| 1-2            | 2 bytes | Aftertreatment 2 Secondary Air Differential Pressure | 3833 |
| 3-4            | 2 bytes | Aftertreatment 2 Secondary Air Temperature           | 3834 |
| 5-6            | 2 bytes | Aftertreatment 2 Secondary Air Mass Flow             | 3835 |
| 7-8            | 2 bytes | Aftertreatment 2 Secondary Air Pressure              | 3838 |

**PGN 64877      Aftertreatment 1 Air Control 2****AT1AC2**

This PGN contains information about the Aftertreatment 1 Air Control.

NOTE: This message will be transmitted by the engine or aftertreatment controller. Other aftertreatment air control information could be added in the future.

Transmission Repetition Rate: 500 msec  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 109      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64877 (0x00FD6D)

| Start Position | Length  | Parameter Name                                       | SPN  |
|----------------|---------|------------------------------------------------------|------|
| 1-2            | 2 bytes | Aftertreatment 1 Secondary Air Differential Pressure | 3830 |
| 3-4            | 2 bytes | Aftertreatment 1 Secondary Air Temperature           | 3831 |
| 5-6            | 2 bytes | Aftertreatment 1 Secondary Air Mass Flow             | 3832 |
| 7-8            | 2 bytes | Aftertreatment 1 Secondary Air Pressure              | 3837 |

**(R) PGN 64878      Aftertreatment 1 SCR Service Information****SCR1**

Used to provide information to an inspection tool regarding the proper use of reagent in SCR type emissions control systems.

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 110      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64878 (0x00FD6E)

| Start Position | Length  | Parameter Name                                                    | SPN  |
|----------------|---------|-------------------------------------------------------------------|------|
| 1-2            | 2 bytes | Aftertreatment 1 SCR Average Catalyst Reagent Consumption         | 3826 |
| 3-4            | 2 bytes | Aftertreatment 1 SCR Commanded Catalyst Reagent Consumption       | 3828 |
| 5              | 1 byte  | Aftertreatment 1 SCR Catalyst Conversion Efficiency               | 4364 |
| 6-7            | 2 bytes | Aftertreatment 1 SCR Operator Inducement Active Traveled Distance | 5463 |

**PGN 64879      Electronic Engine Controller 8****EEC8**

Engine related parameters

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 111      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64879 (0x00FD6F)

| Start Position | Length  | Parameter Name                                                                | SPN  |
|----------------|---------|-------------------------------------------------------------------------------|------|
| 1-2            | 2 bytes | Engine Exhaust Gas Recirculation 1 (EGR1) Valve 2 Control                     | 3821 |
| 3-4            | 2 bytes | Engine Exhaust Gas Recirculation 1 (EGR1) Cooler Intake Temperature           | 4750 |
| 5-6            | 2 bytes | Engine Exhaust Gas Recirculation 1 (EGR1) Cooler Intake Gas Absolute Pressure | 4751 |
| 7              | 1 byte  | Engine Exhaust Gas Recirculation 1 (EGR1) Cooler Efficiency                   | 4752 |

**PGN 64880 Door ramp control****DRC**

This message reports the current status of door ramps

Transmission Repetition Rate: Every 1 s while active and on change of state but no faster than every 100 ms.  
Grandfathered definition for systems that implemented this message prior to July, 2010: 1 s when active and on change of state

Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 112 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64880 (0x00FD70)

| Start Position | Length | Parameter Name            | SPN  |
|----------------|--------|---------------------------|------|
| 1.1            | 2 bits | Retract Status of ramp 1  | 3810 |
| 1.3            | 2 bits | Enable status of ramp 1   | 3811 |
| 1.5            | 2 bits | Movement status of ramp 1 | 3812 |
| 2.1            | 2 bits | Retract Status of ramp 2  | 3813 |
| 2.3            | 2 bits | Enable status of ramp 2   | 3814 |
| 2.5            | 2 bits | Movement status of ramp 2 | 3815 |
| 3.1            | 2 bits | Retract Status of ramp 3  | 3816 |
| 3.3            | 2 bits | Enable status of ramp 3   | 3817 |
| 3.5            | 2 bits | Movement status of ramp 3 | 3818 |
| 4.1            | 2 bits | Retract Status of ramp 4  | 4454 |
| 4.3            | 2 bits | Enable status of ramp 4   | 4455 |
| 4.5            | 2 bits | Movement status of ramp 4 | 4456 |
| 5.1            | 2 bits | Retract Status of ramp 5  | 4457 |
| 5.3            | 2 bits | Enable status of ramp 5   | 4458 |
| 5.5            | 2 bits | Movement status of ramp 5 | 4459 |



**(R) PGN 64881      Brake actuator stroke status****BSA**

The Brake Stroke Alert (BSA) message will provide the brake actuator stroke status for up to 20 wheel ends.

Transmission Repetition Rate: 1 sec  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 113      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64881 (0x00FD71)

| Start Position | Length | Parameter Name                    | SPN  |
|----------------|--------|-----------------------------------|------|
| 1.1            | 3 bits | Tractor Brake Stroke Axle 1 Left  | 3785 |
| 1.4            | 3 bits | Tractor Brake Stroke Axle 1 Right | 3786 |
| 1.7-2.1        | 3 bits | Tractor Brake Stroke Axle 2 Left  | 3787 |
| 2.2            | 3 bits | Tractor Brake Stroke Axle 2 Right | 3788 |
| 2.5            | 3 bits | Tractor Brake Stroke Axle 3 Left  | 3789 |
| 2.8-3.1        | 3 bits | Tractor Brake Stroke Axle 3 Right | 3790 |
| 3.3            | 3 bits | Tractor Brake Stroke Axle 4 Left  | 3791 |
| 3.6            | 3 bits | Tractor Brake Stroke Axle 4 Right | 3792 |
| 4.1            | 3 bits | Tractor Brake Stroke Axle 5 Left  | 3793 |
| 4.4            | 3 bits | Tractor Brake Stroke Axle 5 Right | 3794 |
| 4.7-5.1        | 3 bits | Trailer Brake Stroke Axle 1 Left  | 3795 |
| 5.2            | 3 bits | Trailer Brake Stroke Axle 1 Right | 3796 |
| 5.5            | 3 bits | Trailer Brake Stroke Axle 2 Left  | 3797 |
| 5.8-6.1        | 3 bits | Trailer Brake Stroke Axle 2 Right | 3798 |
| 6.3            | 3 bits | Trailer Brake Stroke Axle 3 Left  | 3799 |
| 6.6            | 3 bits | Trailer Brake Stroke Axle 3 Right | 3800 |
| 7.1            | 3 bits | Trailer Brake Stroke Axle 4 Left  | 3801 |
| 7.4            | 3 bits | Trailer Brake Stroke Axle 4 Right | 3802 |
| 7.7-8.1        | 3 bits | Trailer Brake Stroke Axle 5 Left  | 3803 |
| 8.2            | 3 bits | Trailer Brake Stroke Axle 5 Right | 3804 |

**PGN 64882      Engine Spark Voltage 6****ESV6**

The PGN contains information about spark voltage values for cylinders 21 through 24. This is the secondary voltage of the combustion event.

Transmission Repetition Rate: On request  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 114      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64882 (0x00FD72)

| Start Position | Length  | Parameter Name       | SPN  |
|----------------|---------|----------------------|------|
| 1-2            | 2 bytes | Engine Spark Plug 21 | 1314 |
| 3-4            | 2 bytes | Engine Spark Plug 22 | 1315 |
| 5-6            | 2 bytes | Engine Spark Plug 23 | 1316 |
| 7-8            | 2 bytes | Engine Spark Plug 24 | 1317 |

**PGN 64883 Engine Spark Voltage 5****ESV5**

The PGN contains information about spark voltage values for cylinders 17 through 20. This is the secondary voltage of the combustion event.

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 115 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64883 (0x00FD73)

| Start Position | Length  | Parameter Name       | SPN  |
|----------------|---------|----------------------|------|
| 1-2            | 2 bytes | Engine Spark Plug 17 | 1310 |
| 3-4            | 2 bytes | Engine Spark Plug 18 | 1311 |
| 5-6            | 2 bytes | Engine Spark Plug 19 | 1312 |
| 7-8            | 2 bytes | Engine Spark Plug 20 | 1313 |

**PGN 64884 Engine Spark Voltage 4****ESV4**

The PGN contains information about spark voltage values for cylinders 13 through 16. This is the secondary voltage of the combustion event.

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 116 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64884 (0x00FD74)

| Start Position | Length  | Parameter Name       | SPN  |
|----------------|---------|----------------------|------|
| 1-2            | 2 bytes | Engine Spark Plug 13 | 1306 |
| 3-4            | 2 bytes | Engine Spark Plug 14 | 1307 |
| 5-6            | 2 bytes | Engine Spark Plug 15 | 1308 |
| 7-8            | 2 bytes | Engine Spark Plug 16 | 1309 |

**PGN 64885      Engine Spark Voltage 3****ESV3**

The PGN contains information about spark voltage values for cylinders 9 through 12. This is the secondary voltage of the combustion event.

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 117      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64885 (0x00FD75)

| Start Position | Length  | Parameter Name       | SPN  |
|----------------|---------|----------------------|------|
| 1-2            | 2 bytes | Engine Spark Plug 9  | 1302 |
| 3-4            | 2 bytes | Engine Spark Plug 10 | 1303 |
| 5-6            | 2 bytes | Engine Spark Plug 11 | 1304 |
| 7-8            | 2 bytes | Engine Spark Plug 12 | 1305 |

**PGN 64886      Engine Spark Voltage 2****ESV2**

The PGN contains information about spark voltage values for cylinders 5 through 8. This is the secondary voltage of the combustion event.

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 118      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64886 (0x00FD76)

| Start Position | Length  | Parameter Name      | SPN  |
|----------------|---------|---------------------|------|
| 1-2            | 2 bytes | Engine Spark Plug 5 | 1298 |
| 3-4            | 2 bytes | Engine Spark Plug 6 | 1299 |
| 5-6            | 2 bytes | Engine Spark Plug 7 | 1300 |
| 7-8            | 2 bytes | Engine Spark Plug 8 | 1301 |

**PGN 64887      Engine Spark Voltage 1****ESV1**

The PGN contains information about spark voltage values for cylinders 1 through 4. This is the secondary voltage of the combustion event.

Transmission Repetition Rate:      On request  
Data Length:                              8  
Extended Data Page:                      0  
Data Page:                                  0  
PDU Format:                                253  
PDU Specific:                              119                      PGN Supporting Information:  
Default Priority:                          6  
Parameter Group Number:                64887 (0x00FD77)

| Start Position | Length  | Parameter Name      | SPN  |
|----------------|---------|---------------------|------|
| 1-2            | 2 bytes | Engine Spark Plug 1 | 1294 |
| 3-4            | 2 bytes | Engine Spark Plug 2 | 1295 |
| 5-6            | 2 bytes | Engine Spark Plug 3 | 1296 |
| 7-8            | 2 bytes | Engine Spark Plug 4 | 1297 |

**PGN 64888      Aftertreatment 2 Trip Information****AT2TI**

This PGN contains trip total information about the aftertreatment 2.

NOTE: The SPNs in this PGN need to be reset by the reset PGN 56832.

Transmission Repetition Rate:      On request  
Data Length:                              32  
Extended Data Page:                      0  
Data Page:                                  0  
PDU Format:                                253  
PDU Specific:                              120                      PGN Supporting Information:  
Default Priority:                          6  
Parameter Group Number:                64888 (0x00FD78)

| Start Position | Length  | Parameter Name                                                       | SPN  |
|----------------|---------|----------------------------------------------------------------------|------|
| 01-04          | 4 bytes | Aftertreatment 2 Trip Fuel Used                                      | 3741 |
| 05-08          | 4 bytes | Aftertreatment 2 Trip Active Regeneration Time                       | 3742 |
| 09-12          | 4 bytes | Aftertreatment 2 Trip Disabled Time                                  | 3743 |
| 13-16          | 4 bytes | Aftertreatment 2 Trip Number of Active Regenerations                 | 3744 |
| 17-20          | 4 bytes | Aftertreatment 2 Trip Passive Regeneration Time                      | 3745 |
| 21-24          | 4 bytes | Aftertreatment 2 Trip Number of Passive Regenerations                | 3746 |
| 25-28          | 4 bytes | Aftertreatment 2 Trip Number of Active Regeneration Inhibit Requests | 3747 |
| 29-32          | 4 bytes | Aftertreatment 2 Trip Number of Active Regeneration Manual Requests  | 3748 |

**PGN 64889      Aftertreatment 1 Trip Information****AT1TI**

This PGN contains trip total information about the aftertreatment 1.

NOTE: The SPNs in this PGN need to be reset by the reset PGN 56832.

Transmission Repetition Rate: On request  
Data Length: 32  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 121      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64889 (0x00FD79)

| Start Position | Length  | Parameter Name                                                       | SPN  |
|----------------|---------|----------------------------------------------------------------------|------|
| 01-04          | 4 bytes | Aftertreatment 1 Trip Fuel Used                                      | 3733 |
| 05-08          | 4 bytes | Aftertreatment 1 Trip Active Regeneration Time                       | 3734 |
| 09-12          | 4 bytes | Aftertreatment 1 Trip Disabled Time                                  | 3735 |
| 13-16          | 4 bytes | Aftertreatment 1 Trip Number of Active Regenerations                 | 3736 |
| 17-20          | 4 bytes | Aftertreatment 1 Trip Passive Regeneration Time                      | 3737 |
| 21-24          | 4 bytes | Aftertreatment 1 Trip Number of Passive Regenerations                | 3738 |
| 25-28          | 4 bytes | Aftertreatment 1 Trip Number of Active Regeneration Inhibit Requests | 3739 |
| 29-32          | 4 bytes | Aftertreatment 1 Trip Number of Active Regeneration Manual Requests  | 3740 |

**(R) PGN 64890      Aftertreatment 2 Service****AT2S**

This PGN contains information about the aftertreatment 2 (diesel particulate filter 2 soot and ash load).

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 122      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64890 (0x00FD7A)

| Start Position | Length  | Parameter Name                                                              | SPN  |
|----------------|---------|-----------------------------------------------------------------------------|------|
| 1              | 1 byte  | Diesel Particulate Filter 2 Soot Load Percent                               | 3722 |
| 2              | 1 byte  | Diesel Particulate Filter 2 Ash Load Percent                                | 3723 |
| 3-6            | 4 bytes | Diesel Particulate Filter 2 Time Since Last Active Regeneration             | 3724 |
| 7              | 2 bytes | Aftertreatment 2 Diesel Particulate Filter Soot Load Regeneration Threshold | 5467 |

**(R) PGN 64891     Aftertreatment 1 Service****AT1S**

This PGN contains information about the aftertreatment 1 (diesel particulate filter 1 soot and ash load).

Transmission Repetition Rate:     On request  
Data Length:     8  
Extended Data Page:     0  
Data Page:     0  
PDU Format:     253  
PDU Specific:     123     PGN Supporting Information:  
Default Priority:     6  
Parameter Group Number:     64891 (0x00FD7B)

| Start Position | Length  | Parameter Name                                                              | SPN  |
|----------------|---------|-----------------------------------------------------------------------------|------|
| 1              | 1 byte  | Diesel Particulate Filter 1 Soot Load Percent                               | 3719 |
| 2              | 1 byte  | Diesel Particulate Filter 1 Ash Load Percent                                | 3720 |
| 3-6            | 4 bytes | Diesel Particulate Filter 1 Time Since Last Active Regeneration             | 3721 |
| 7              | 2 bytes | Aftertreatment 1 Diesel Particulate Filter Soot Load Regeneration Threshold | 5466 |

**PGN 64892 Diesel Particulate Filter Control 1****DPFC1**

This PGN contains information about the diesel particulate filter regeneration control.

If there are aftertreatment systems on two banks, this PGN represents the composite information from both banks.

NOTE: This message will be transmitted by the engine or aftertreatment system controller.

Transmission Repetition Rate: Every 1 s and on change of state but no faster than every 100 ms. Grandfathered definition for systems that implemented this message prior to July, 2010: 1 s and on change

Data Length: 8

Extended Data Page: 0

Data Page: 0

PDU Format: 253

PDU Specific: 124 PGN Supporting Information:

Default Priority: 6

Parameter Group Number: 64892 (0x00FD7C)

| Start Position | Length | Parameter Name                                                                                   | SPN  |
|----------------|--------|--------------------------------------------------------------------------------------------------|------|
| 1.1            | 3 bits | Diesel Particulate Filter Lamp Command                                                           | 3697 |
| 2.1            | 2 bits | Diesel Particulate Filter Passive Regeneration Status                                            | 3699 |
| 2.3            | 2 bits | Diesel Particulate Filter Active Regeneration Status                                             | 3700 |
| 2.5            | 3 bits | Diesel Particulate Filter Status                                                                 | 3701 |
| 3.1            | 2 bits | Diesel Particulate Filter Active Regeneration Inhibited Status                                   | 3702 |
| 3.3            | 2 bits | Diesel Particulate Filter Active Regeneration Inhibited Due to Inhibit Switch                    | 3703 |
| 3.5            | 2 bits | Diesel Particulate Filter Active Regeneration Inhibited Due to Clutch Disengaged                 | 3704 |
| 3.7            | 2 bits | Diesel Particulate Filter Active Regeneration Inhibited Due to Service Brake Active              | 3705 |
| 4.1            | 2 bits | Diesel Particulate Filter Active Regeneration Inhibited Due to PTO Active                        | 3706 |
| 4.3            | 2 bits | Diesel Particulate Filter Active Regeneration Inhibited Due to Accelerator Pedal Off Idle        | 3707 |
| 4.5            | 2 bits | Diesel Particulate Filter Active Regeneration Inhibited Due to Out of Neutral                    | 3708 |
| 4.7            | 2 bits | Diesel Particulate Filter Active Regeneration Inhibited Due to Vehicle Speed Above Allowed Speed | 3709 |
| 5.1            | 2 bits | Diesel Particulate Filter Active Regeneration Inhibited Due to Parking Brake Not Set             | 3710 |
| 5.3            | 2 bits | Diesel Particulate Filter Active Regeneration Inhibited Due to Low Exhaust Gas Temperature       | 3711 |
| 5.5            | 2 bits | Diesel Particulate Filter Active Regeneration Inhibited Due to System Fault Active               | 3712 |
| 5.7            | 2 bits | Diesel Particulate Filter Active Regeneration Inhibited Due to System Timeout                    | 3713 |
| 6.1            | 2 bits | Diesel Particulate Filter Active Regeneration Inhibited Due to Temporary System Lockout          | 3714 |
| 6.3            | 2 bits | Diesel Particulate Filter Active Regeneration Inhibited Due to Permanent System Lockout          | 3715 |
| 6.5            | 2 bits | Diesel Particulate Filter Active Regeneration Inhibited Due to Engine Not Warmed Up              | 3716 |
| 6.7            | 2 bits | Diesel Particulate Filter Active Regeneration Inhibited Due to Vehicle Speed Below Allowed Speed | 3717 |
| 7.1            | 2 bits | Diesel Particulate Filter Automatic Active Regeneration Initiation Configuration                 | 3718 |
| 7.3            | 3 bits | Exhaust System High Temperature Lamp Command                                                     | 3698 |
| 7.6            | 3 bits | Diesel Particulate Filter Active Regeneration Forced Status                                      | 4175 |

**PGN 64894 Adaptive Front-Lighting System Status****AFSS**

This message reports information about the current operation mode of the Adaptive Front-Lighting System (AFS). The Message may include information about dynamic bending light and light distribution. The message provides feedback to the light controller and may be used to ensure a fail safe state in case of malfunction.

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 126 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64894 (0x00FD7E)

| Start Position | Length | Parameter Name                       | SPN  |
|----------------|--------|--------------------------------------|------|
| 1.1            | 3 bits | Left Headlamp Dynamic Bending Light  | 3691 |
| 1.4            | 3 bits | Right Headlamp Dynamic Bending Light | 3692 |
| 2.1            | 4 bits | Left Headlamp Light Distribution     | 3693 |
| 2.5            | 4 bits | Right Headlamp Light Distribution    | 3694 |

**PGN 64895 Engine Configuration 2****EC2**

Contains static information about the engine. To be used with data that will not change during vehicle operation.

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 127 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64895 (0x00FD7F)

| Start Position | Length | Parameter Name                           | SPN  |
|----------------|--------|------------------------------------------|------|
| 1              | 1 byte | Maximum Crank Attempts per Start Attempt | 3670 |

**PGN 64897 EGR Cooler Bypass****EGRBV**

Contains information about the EGR Cooler Bypass

Transmission Repetition Rate: 500 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 129 PGN Supporting Information:  
Default Priority: 5  
Parameter Group Number: 64897 (0x00FD81)

| Start Position | Length | Parameter Name                       | SPN  |
|----------------|--------|--------------------------------------|------|
| 1              | 1 byte | EGR1 Cooler Bypass Actuator Position | 3672 |



**PGN 64899 Transfer Case Information****TCI**

## Transfer Case Information

Transmission Repetition Rate: Every 1 s and on change of state but no faster than every 100 ms. Grandfathered definition for systems that implemented this message prior to July, 2010: 1 s or on change

Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 131 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64899 (0x00FD83)

| Start Position | Length | Parameter Name       | SPN  |
|----------------|--------|----------------------|------|
| 1.1            | 3 bits | Transfer case status | 3645 |

**PGN 64900 Engine Fluid Level/Pressure 9****EFL/P9**

This message contains Engine Intake Valve Actuation Oil Pressure information.

Transmission Repetition Rate: 500 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 132 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64900 (0x00FD84)

| Start Position | Length  | Parameter Name                                              | SPN  |
|----------------|---------|-------------------------------------------------------------|------|
| 1-2            | 2 bytes | Engine Intake Valve Actuation Oil Pressure for Cylinder #17 | 3640 |
| 3-4            | 2 bytes | Engine Intake Valve Actuation Oil Pressure for Cylinder #18 | 3641 |
| 5-6            | 2 bytes | Engine Intake Valve Actuation Oil Pressure for Cylinder #19 | 3642 |
| 7-8            | 2 bytes | Engine Intake Valve Actuation Oil Pressure for Cylinder #20 | 3643 |

**PGN 64901 Engine Fluid Level/Pressure 8****EFL/P8**

This message contains Engine Intake Valve Actuation Oil Pressure information.

Transmission Repetition Rate: 500 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 133 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64901 (0x00FD85)

| Start Position | Length  | Parameter Name                                              | SPN  |
|----------------|---------|-------------------------------------------------------------|------|
| 1-2            | 2 bytes | Engine Intake Valve Actuation Oil Pressure for Cylinder #13 | 3636 |
| 3-4            | 2 bytes | Engine Intake Valve Actuation Oil Pressure for Cylinder #14 | 3637 |
| 5-6            | 2 bytes | Engine Intake Valve Actuation Oil Pressure for Cylinder #15 | 3638 |
| 7-8            | 2 bytes | Engine Intake Valve Actuation Oil Pressure for Cylinder #16 | 3639 |

**PGN 64902 Engine Fluid Level/Pressure 7****EFL/P7**

This message contains Engine Intake Valve Actuation Oil Pressure information.

Transmission Repetition Rate: 500 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 134 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64902 (0x00FD86)

| Start Position | Length  | Parameter Name                                              | SPN  |
|----------------|---------|-------------------------------------------------------------|------|
| 1-2            | 2 bytes | Engine Intake Valve Actuation Oil Pressure for Cylinder #9  | 3632 |
| 3-4            | 2 bytes | Engine Intake Valve Actuation Oil Pressure for Cylinder #10 | 3633 |
| 5-6            | 2 bytes | Engine Intake Valve Actuation Oil Pressure for Cylinder #11 | 3634 |
| 7-8            | 2 bytes | Engine Intake Valve Actuation Oil Pressure for Cylinder #12 | 3635 |

**PGN 64903 Engine Fluid Level/Pressure 6****EFL/P6**

This message contains Engine Intake Valve Actuation Oil Pressure information.

Transmission Repetition Rate: 500 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 135 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64903 (0x00FD87)

| Start Position | Length  | Parameter Name                                             | SPN  |
|----------------|---------|------------------------------------------------------------|------|
| 1-2            | 2 bytes | Engine Intake Valve Actuation Oil Pressure for Cylinder #5 | 3628 |
| 3-4            | 2 bytes | Engine Intake Valve Actuation Oil Pressure for Cylinder #6 | 3629 |
| 5-6            | 2 bytes | Engine Intake Valve Actuation Oil Pressure for Cylinder #7 | 3630 |
| 7-8            | 2 bytes | Engine Intake Valve Actuation Oil Pressure for Cylinder #8 | 3631 |

**PGN 64904 Engine Fluid Level/Pressure 5****EFL/P5**

This message contains Engine Intake Valve Actuation Oil Pressure information.

Transmission Repetition Rate: 500 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 136 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64904 (0x00FD88)

| Start Position | Length  | Parameter Name                                             | SPN  |
|----------------|---------|------------------------------------------------------------|------|
| 1-2            | 2 bytes | Engine Intake Valve Actuation Oil Pressure for Cylinder #1 | 3624 |
| 3-4            | 2 bytes | Engine Intake Valve Actuation Oil Pressure for Cylinder #2 | 3625 |
| 5-6            | 2 bytes | Engine Intake Valve Actuation Oil Pressure for Cylinder #3 | 3626 |
| 7-8            | 2 bytes | Engine Intake Valve Actuation Oil Pressure for Cylinder #4 | 3627 |

**PGN 64905      Vehicle Direction/Speed 2****VDS2**

Vehicle Direction/Speed 2 PGN contains the vehicle roll data.

Transmission Repetition Rate:    On request  
Data Length:                        8  
Extended Data Page:               0  
Data Page:                          0  
PDU Format:                         253  
PDU Specific:                      137                    PGN Supporting Information:  
Default Priority:                   6  
Parameter Group Number:        64905 (0x00FD89)

| Start Position | Length  | Parameter Name | SPN  |
|----------------|---------|----------------|------|
| 1-2            | 2 bytes | Vehicle Roll   | 3623 |

**PGN 64906      SAE J2012 DTC Display****J2012**

Conveys basic SAE J2012 DTC information for on-board or service tool displays.

If PGN 64906 is requested and a supporting device has no active or inactive J2012 DTCs, PGN 64906 shall be sent with the first data byte ( Number of J2012 DTCs) set to zero. Any unused bytes in the PGN shall be set to 255. When two or more J2012 DTCs are indicated PGN 64906 must be sent via Transport Protocol (See J1939-21).

See supporting information for data byte arrangement and example.

Transmission Repetition Rate:    On request  
Data Length:                        Variable  
Extended Data Page:               0  
Data Page:                          0  
PDU Format:                         253  
PDU Specific:                      138                    PGN Supporting Information: See Appendix D - PGN 64906  
Default Priority:                   7  
Parameter Group Number:        64906 (0x00FD8A)

| Start Position | Length  | Parameter Name             | SPN  |
|----------------|---------|----------------------------|------|
| 1              | 1 byte  | Number of J2012 DTCs       | 3619 |
| 2-6            | 5 bytes | J2012 DTC                  | 3620 |
| 7.1            | 1 bit   | J2012 DTC Status           | 3621 |
| 7.2            | 7 bits  | J2012 DTC Occurrence Count | 3622 |

**PGN 64907      Aftertreatment 2 Gas Parameters****AT2GP**

Diesel particulate filter gas parameters for system or bank 2

Transmission Repetition Rate: 500 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 139      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64907 (0x00FD8B)

| Start Position | Length  | Parameter Name                              | SPN  |
|----------------|---------|---------------------------------------------|------|
| 1-2            | 2 bytes | Diesel Particulate Filter Intake Pressure 2 | 3611 |
| 3-4            | 2 bytes | Diesel Particulate Filter Outlet Pressure 2 | 3612 |

**PGN 64908      Aftertreatment 1 Gas Parameters****AT1GP**

Diesel particulate filter gas parameters for system or bank 1

Transmission Repetition Rate: 500 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 140      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64908 (0x00FD8C)

| Start Position | Length  | Parameter Name                              | SPN  |
|----------------|---------|---------------------------------------------|------|
| 1-2            | 2 bytes | Diesel Particulate Filter Intake Pressure 1 | 3609 |
| 3-4            | 2 bytes | Diesel Particulate Filter Outlet Pressure 1 | 3610 |

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**PGN 64912      Advertised Engine Torque Curve****AETC**

This message conveys the advertised torque curve for the engine, as typically seen on specification sheets available from most engine manufacturers. The collection conditions for the data conveyed are indicated by SPN 3558 – AETC Data Collection Standard.

This map does not contain dynamic elements, and does not change during engine operation. For engines capable of dynamically switching between torque curves or ratings during operation, this map contains values for the highest (most powerful) rating. This map is not intended for use in real time engine control, but merely to indicate what engine rating is installed in the vehicle.

Data points on the curve are in order from left to right, and, at a minimum, must span from the lowest rpm where peak torque can be produced to the high speed governor breakpoint. SPN 3559 – Number of AETC Data Points indicates the number of data point pairs being sent. A minimum of 5 points must be supported, with up to 15 available as needed to properly convey the shape of the torque curve. Speed values need not be evenly incremented.

The pair of data points (a and b) are repeated in the PGN for the number of data points identified in byte 1.

Transmission Repetition Rate:	On request	
Data Length:	Variable	
Extended Data Page:	0	
Data Page:	0	
PDU Format:	253	
PDU Specific:	144	PGN Supporting Information: See Appendix D - PGN 64912
Default Priority:	6	
Parameter Group Number:	64912 (0x00FD90)	

Start Position	Length	Parameter Name	SPN
1.1	4 bits	AETC Data Collection Standard	3558
1.5	4 bits	Number of AETC data points	3559
a	2 bytes	AETC Speed Value	3560
b	2 bytes	AETC Torque value	3561

**PGN 64914      Engine Operating Information****EOI**

Contains engine parameters related to operation.

Transmission Repetition Rate:	250 ms	
Data Length:	8	
Extended Data Page:	0	
Data Page:	0	
PDU Format:	253	
PDU Specific:	146	PGN Supporting Information:
Default Priority:	3	
Parameter Group Number:	64914 (0x00FD92)	

Start Position	Length	Parameter Name	SPN
1.1	4 bits	Engine Operating State	3543
1.5	2 bits	Fuel Pump Primer Control	4082
2-3	2 bytes	Time Remaining in Engine Operating State	3544
4.1	2 bits	Engine Fuel Shutoff Vent Control	3608
4.3	2 bits	Engine Fuel Shutoff 1 Control	632
4.5	2 bits	Engine Fuel Shutoff 2 Control	2807
4.7	2 bits	Engine Fuel Shutoff Valve Leak Test Control	3601
5.1	2 bits	Engine Oil Priming Pump Control	3589
5.3	2 bits	Engine Oil Pre-heater Control	3602
5.5	2 bits	Engine Electrical System Power Conservation Control	3603
5.7	2 bits	Engine Block / Coolant Pre-heater Control	3604
6.1	2 bits	Engine Coolant Circulating Pump Control	3605
6.3	2 bits	Engine Controlled Shutdown Request	3606

6.5	2 bits	Engine Emergency (Immediate) Shutdown Indication	3607
8	1 byte	Engine Derate Request	3644

**(R) PGN 64916      Electronic Engine Controller 7****EEC7**

Engine related parameters

Transmission Repetition Rate:	100 ms	
Data Length:	8	
Extended Data Page:	0	
Data Page:	0	
PDU Format:	253	
PDU Specific:	148	PGN Supporting Information:
Default Priority:	6	
Parameter Group Number:	64916 (0x00FD94)	

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Engine Exhaust Gas Recirculation 1 Valve Position	27
3-4	2 bytes	Engine Exhaust Gas Recirculation 1 Valve 2 Position	3822
5-6	2 bytes	Engine Crankcase Breather Oil Separator Speed	5444
7-8	2 bytes	Commanded Engine Intake Manifold Pressure	5312

**(R) PGN 64917      Transmission Fluids 2****TRF2**

Transmission Repetition Rate:	1 s	
Data Length:	8	
Extended Data Page:	0	
Data Page:	0	
PDU Format:	253	
PDU Specific:	149	PGN Supporting Information:
Default Priority:	6	
Parameter Group Number:	64917 (0x00FD95)	

Start Position	Length	Parameter Name	SPN
1.1	2 bits	Transmission Oil Filter Restriction Switch	3359
1.3	2 bits	Transmission Oil Level Switch	3533
1.5	2 bits	Transmission Overheat Indicator	5345
2-3	2 bytes	Transmission Torque Converter Oil Outlet Temperature	3823
4	1 byte	Transmission Oil Life Remaining	4177

**(R) PGN 64920      Aftertreatment 1 Historical Information****AT1HI**

Contains information about the history of the aftertreatment 1 system

Transmission Repetition Rate: On request  
 Data Length: Variable  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 152      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64920 (0x00FD98)

Start Position	Length	Parameter Name	SPN
01-04	4 bytes	Aftertreatment 1 Total Fuel Used	3522
05-08	4 bytes	Aftertreatment 1 Total Regeneration Time	3523
09-12	4 bytes	Aftertreatment 1 Total Disabled Time	3524
13-16	4 bytes	Aftertreatment 1 Total Number of Active Regenerations	3525
17-20	4 bytes	Aftertreatment 1 Total Passive Regeneration Time	3725
21-24	4 bytes	Aftertreatment 1 Total Number of Passive Regenerations	3726
25-28	4 bytes	Aftertreatment 1 Total Number of Active Regeneration Inhibit Requests	3727
29-32	4 bytes	Aftertreatment 1 Total Number of Active Regeneration Manual Requests	3728
33-36	4 bytes	Aftertreatment 1 Average Time Between Active Regenerations	5454

**(R) PGN 64921      Aftertreatment 2 Historical information****AT2HI**

Contains information about the history of the aftertreatment 2 system

Transmission Repetition Rate: On request  
 Data Length: Variable  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 153      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64921 (0x00FD99)

Start Position	Length	Parameter Name	SPN
01-04	4 bytes	Aftertreatment 2 Total Fuel Used	3526
05-08	4 bytes	Aftertreatment 2 Total Regeneration Time	3527
09-12	4 bytes	Aftertreatment 2 Total Disabled Time	3528
13-16	4 bytes	Aftertreatment 2 Total Number of Active Regenerations	3529
17-20	4 bytes	Aftertreatment 2 Total Passive Regeneration Time	3729
21-24	4 bytes	Aftertreatment 2 Total Number of Passive Regenerations	3730
25-28	4 bytes	Aftertreatment 2 Total Number of Active Regeneration Inhibit Requests	3731
29-32	4 bytes	Aftertreatment 2 Total Number of Active Regeneration Manual Requests	3732
33-36	4 bytes	Aftertreatment 2 Average Time Between Active Regenerations	5455

**PGN 64923      Aftertreatment 1 SCR Reagent Information****CRI1**

Sensor Information which measures temperature, concentration, and conductivity of the catalyst reagent of the aftertreatment 1 system.

Transmission Repetition Rate: 1 sec  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 155      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64923 (0x00FD9B)

Start Position	Length	Parameter Name	SPN
1	1 byte	Aftertreatment 1 SCR Catalyst Reagent Temperature 2	3515
2	1 byte	Aftertreatment 1 SCR Catalyst Reagent Concentration	3516
3	1 byte	Aftertreatment 1 SCR Catalyst Reagent Conductivity	3518
4.1	5 bits	Aftertreatment 1 SCR Catalyst Reagent Temperature 2 Preliminary FMI	3519
5.1	5 bits	Aftertreatment 1 SCR Catalyst Reagent Properties Preliminary FMI	3520
6.1	4 bits	Aftertreatment 1 SCR Catalyst Reagent Type	3521

**(R) PGN 64924      Sensor Electrical Power #2****SEP2**

Voltage supplies for sensors #2

Transmission Repetition Rate: 1 sec  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 156      PGN Supporting Information: See Appendix D - PGN 65104  
 Default Priority: 6  
 Parameter Group Number: 64924 (0x00FD9C)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Sensor supply voltage 5	3513
3-4	2 bytes	Sensor supply voltage 6	3514
5-6	2 bytes	Sensor supply voltage 7	5125
7-8	2 bytes	Sensor supply voltage 8	5126

**PGN 64925      Sensor Electrical Power #1****SEP1**

Voltage supplies for sensors #1

Transmission Repetition Rate: 1 sec  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 157      PGN Supporting Information: See Appendix D - PGN 65104  
 Default Priority: 6  
 Parameter Group Number: 64925 (0x00FD9D)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Sensor supply voltage 1	3509



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3-4	2 bytes	Sensor supply voltage 2	3510
5-6	2 bytes	Sensor supply voltage 3	3511
7-8	2 bytes	Sensor supply voltage 4	3512

**PGN 64926      Aftertreatment 2 Air Control 1****AT2AC1**

Contains information about the aftertreatment 2 air system

Transmission Repetition Rate: 500 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 158      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64926 (0x00FD9E)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Aftertreatment 2 Supply Air Pressure	3499
3-4	2 bytes	Aftertreatment 2 Purge Air Pressure	3500
5-6	2 bytes	Aftertreatment 2 Air Pressure Control	3501
7.1	1 byte	Aftertreatment 2 Air Pressure Actuator Position	3502
8.1	2 bits	Aftertreatment 2 Air System Relay	3506
8.3	2 bits	Aftertreatment 2 Atomization Air Actuator	3505
8.5	2 bits	Aftertreatment 2 Purge Air Actuator	3504
8.7	2 bits	Aftertreatment 2 Air Enable Actuator	3503

**PGN 64927      Aftertreatment 1 Air Control 1****AT1AC1**

Contains information about the aftertreatment 1 air system

Transmission Repetition Rate: 500 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 159      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64927 (0x00FD9F)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Aftertreatment 1 Supply Air Pressure	3485
3-4	2 bytes	Aftertreatment 1 Purge Air Pressure	3486
5-6	2 bytes	Aftertreatment 1 Air Pressure Control	3487
7.1	1 byte	Aftertreatment 1 Air Pressure Actuator Position	3488
8.1	2 bits	Aftertreatment 1 Air System Relay	3492
8.3	2 bits	Aftertreatment 1 Atomization Air Actuator	3491
8.5	2 bits	Aftertreatment 1 Purge Air Actuator	3490
8.7	2 bits	Aftertreatment 1 Air Enable Actuator	3489

**PGN 64928      Aftertreatment 2 Fuel Control 1****AT2FC1**

Contains information about the aftertreatment 2 fuel system

Transmission Repetition Rate: 500 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 160      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64928 (0x00FDA0)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Aftertreatment 2 Fuel Pressure 1	3494
3-4	2 bytes	Aftertreatment 2 Fuel Rate	3495
5-6	2 bytes	Aftertreatment 2 Fuel Pressure 1 Control	3493
7.1	2 bits	Aftertreatment 2 Fuel Drain Actuator	4098
7.3	2 bits	Aftertreatment 2 Ignition	3498
7.5	2 bits	Aftertreatment 2 Regeneration Status	3497
7.7	2 bits	Aftertreatment 2 Fuel Enable Actuator	3496
8	1 byte	Aftertreatment 2 Fuel Injector 1 Heater Control	4302

**PGN 64929      Aftertreatment 1 Fuel Control 1****AT1FC1**

Contains information about the aftertreatment 1 fuel system

Transmission Repetition Rate: 500 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 161      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64929 (0x00FDA1)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Aftertreatment 1 Fuel Pressure 1	3480
3-4	2 bytes	Aftertreatment 1 Fuel Rate	3481
5-6	2 bytes	Aftertreatment 1 Fuel Pressure 1 Control	3479
7.1	2 bits	Aftertreatment 1 Fuel Drain Actuator	4097
7.3	2 bits	Aftertreatment 1 Ignition	3484
7.5	2 bits	Aftertreatment 1 Regeneration Status	3483
7.7	2 bits	Aftertreatment 1 Fuel Enable Actuator	3482
8	1 byte	Aftertreatment 1 Fuel Injector 1 Heater Control	4301

**(R) PGN 64930 Fuel Information 3 (Gaseous)****GFI3**

Gaseous fuel information 3

Transmission Repetition Rate: 500 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 162 PGN Supporting Information:  
 Default Priority: 4  
 Parameter Group Number: 64930 (0x00FDA2)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Engine Fuel Valve 2 Intake Absolute Pressure	3466
3-4	2 bytes	Engine Gas 2 Mass Flow Rate	3467
5	1 byte	Engine Fuel Temperature 2	3468
7-8	2 bytes	Engine Fuel Valve 2 Outlet Absolute Pressure	3469

**(R) PGN 64931 Electronic Engine Controller 6****EEC6**

Engine related parameters

Transmission Repetition Rate: 100 msec (preferred) or Engine Speed Dependent (if required by application)  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 163 PGN Supporting Information:  
 Default Priority: 4  
 Parameter Group Number: 64931 (0x00FDA3)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Engine Turbocharger Compressor Bypass Actuator 1 Command	3470
3	1 byte	Engine Variable Geometry Turbocharger Actuator #1	641
4	1 byte	Engine Turbocharger Compressor Bypass Actuator 1 Position	3675
5-6	2 bytes	Engine Turbocharger Compressor Bypass Actuator 2 command	5369
7	1 byte	Engine Desired Turbocharger Compressor Bypass Actuator 1 Position	5366
8.1	5 bits	Engine Turbocharger Compressor Bypass Actuator 1 Preliminary FMI	5367
8.6	3 bits	Engine Turbocharger Compressor Bypass Actuator 1 Temperature Status	5368

**PGN 64932 PTO Drive Engagement****PTODE**

Information relating to the request for engagement, consent for engagement, and status of engagement of various specific physical PTO drives. This message may be broadcast by one or all controllers involved in the enabling of a given PTO drive.

Transmission Repetition Rate: 100 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 164 PGN Supporting Information: See Appendix D - PGN 64932  
 Default Priority: 6  
 Parameter Group Number: 64932 (0x00FDA4)

Start Position	Length	Parameter Name	SPN
1.1	2 bits	Enable Switch – Transfer case output shaft PTO	3455
1.3	2 bits	Enable Switch – Transmission output shaft PTO	3454
1.5	2 bits	Enable Switch – Transmission input shaft PTO 2	3453
1.7	2 bits	Enable Switch – Transmission input shaft PTO 1	3452
2.1	2 bits	Enable Switch - PTO Engine Flywheel	3939
2.3	2 bits	Enable Switch - PTO Engine Accessory Drive 1	3942
2.5	2 bits	Enable Switch - PTO Engine Accessory Drive 2	3945
3.1	2 bits	Engagement Consent – Transfer case output shaft PTO	3459
3.3	2 bits	Engagement Consent – Transmission output shaft PTO	3458
3.5	2 bits	Engagement Consent – Transmission input shaft PTO 2	3457
3.7	2 bits	Engagement Consent – Transmission input shaft PTO 1	3456
4.1	2 bits	Engagement Consent - PTO Engine Flywheel	3940
4.3	2 bits	Engagement Consent - PTO Engine Accessory Drive 1	3943
4.5	2 bits	Engagement Consent - PTO Engine Accessory Drive 2	3946
5.1	2 bits	Engagement Status – Transfer case output shaft PTO	3463
5.3	2 bits	Engagement Status – Transmission output shaft PTO	3462
5.5	2 bits	Engagement Status – Transmission input shaft PTO 2	3461
5.7	2 bits	Engagement Status – Transmission input shaft PTO 1	3460
6.1	2 bits	Engagement Status - PTO Engine Flywheel	3941
6.3	2 bits	Engagement Status - PTO Engine Accessory Drive 1	3944
6.5	2 bits	Engagement Status - PTO Engine Accessory Drive 2	3947
7.1	2 bits	At least one PTO engaged	3948

**PGN 64933 Door Control 2****DC2**

Used for door information.

Transmission Repetition Rate: 100 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 165 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64933 (0x00FDA5)

Start Position	Length	Parameter Name	SPN
1.1	2 bits	Lock Status of Door 1	3412
1.3	2 bits	Open Status of Door 1	3413
1.5	2 bits	Enable Status of Door 1	3414
1.7	2 bits	Lock Status of Door 2	3415
2.1	2 bits	Open Status of Door 2	3416
2.3	2 bits	Enable Status of Door 2	3417
2.5	2 bits	Lock Status of Door 3	3418
2.7	2 bits	Open Status of Door 3	3419
3.1	2 bits	Enable Status of Door 3	3420
3.3	2 bits	Lock Status of Door 4	3421
3.5	2 bits	Open Status of Door 4	3422
3.7	2 bits	Enable Status of Door 4	3423
4.1	2 bits	Lock Status of Door 5	3424
4.3	2 bits	Open Status of Door 5	3425
4.5	2 bits	Enable Status of Door 5	3426
4.7	2 bits	Lock Status of Door 6	3427
5.1	2 bits	Open Status of Door 6	3428
5.3	2 bits	Enable Status of Door 6	3429
5.5	2 bits	Lock Status of Door 7	3430
5.7	2 bits	Open Status of Door 7	3431
6.1	2 bits	Enable Status of Door 7	3432
6.3	2 bits	Lock Status of Door 8	3433
6.5	2 bits	Open Status of Door 8	3434
6.7	2 bits	Enable Status of Door 8	3435
7.1	2 bits	Lock Status of Door 9	3436
7.3	2 bits	Open Status of Door 9	3437
7.5	2 bits	Enable Status of Door 9	3438
7.7	2 bits	Lock Status of Door 10	3439
8.1	2 bits	Open Status of Door 10	3440
8.3	2 bits	Enable Status of Door 10	3441

**PGN 64936      Wireless Communications Message 2****WCM2**

Message for reporting status information regarding the second instance of a wireless communications network on a device or system.

See PGN 64937 for the first wireless network.

Transmission Repetition Rate:      On request  
Data Length:      8  
Extended Data Page:      0  
Data Page:      0  
PDU Format:      253  
PDU Specific:      168      PGN Supporting Information:  
Default Priority:      6  
Parameter Group Number:      64936 (0x00FDA8)

Start Position	Length	Parameter Name	SPN
1	8 bits	Network Transceiver Status 2	3442
2	8 bits	Network Service Status 2	3443
3	8 bits	Network Antenna Status 2	3444
4	1 byte	Network Signal Strength 2	3445
5	8 bits	Wireless Communication Network Type 2	3446

**PGN 64937      Wireless Communications Message 1****WCM1**

Message for reporting status information regarding the first instance of a wireless communications network on a device or system.

Transmission Repetition Rate:      On request  
Data Length:      8  
Extended Data Page:      0  
Data Page:      0  
PDU Format:      253  
PDU Specific:      169      PGN Supporting Information:  
Default Priority:      6  
Parameter Group Number:      64937 (0x00FDA9)

Start Position	Length	Parameter Name	SPN
1	8 bits	Network Transceiver Status 1	3368
2	8 bits	Network Service Status 1	3369
3	8 bits	Network Antenna Status 1	3370
4	1 byte	Network Signal Strength 1	3371
5	8 bits	Wireless Communication Network Type 1	3372

**PGN 64938 Engine Fluid Level/Pressure 4****EFL/P4**

4th PGN which identifies parameters that are either measuring various pressures within the engine or identifying engine fluid levels

Transmission Repetition Rate: 500 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 170 PGN Supporting Information: See Appendix D - PGN 64938  
 Default Priority: 6  
 Parameter Group Number: 64938 (0x00FDAA)

Start Position	Length	Parameter Name	SPN
1	1 byte	Engine Charge Air Cooler 1 Intake Pressure	3340
2	1 byte	Engine Charge Air Cooler 2 Intake Pressure	3341
3	1 byte	Engine Coolant Pump Differential Pressure	3342
4-5	2 bytes	Engine Centrifugal Oil Filter speed	3343
6	1 byte	Engine Intercooler Coolant Level	3668
7	1 byte	Engine Aftercooler Coolant Level	3676
8	1 byte	Engine Charge Air Cooler Outlet Pressure	2631

**PGN 64942 Fifth Wheel Smart Systems 2****FWSS2**

Fifth wheel smart system information #2. Message to convey operator parameters associated with the tractor to trailer coupling control and error state.

Transmission Repetition Rate: On request  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 174 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64942 (0x00FDAE)

Start Position	Length	Parameter Name	SPN
1.1	4 bits	Fifth Wheel Error Status	3307
1.5	2 bits	Fifth Wheel Lock Ready to Couple Indicator	3312
1.7	2 bits	Fifth Wheel Lock Couple Status Indicator	3313
2	1 byte	Fifth Wheel Slider Position	3311
3.1	2 bits	Fifth Wheel Slider Lock Indicator	3316



**(R) PGN 64943     Aftertreatment 2 Intermediate Gas****AT2IMG**

The purpose of this PGN is to group the aftertreatment intermediate gas temperature and pressure messages for bank 2.

Transmission Repetition Rate: 500 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 175     PGN Supporting Information: See Appendix D - PGN 64948  
Default Priority: 6  
Parameter Group Number: 64943 (0x00FDAF)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Aftertreatment 2 Exhaust Gas Temperature 2	3283
3-4	2 bytes	Aftertreatment 2 Diesel Particulate Filter Intermediate Gas Temperature	3284
5-6	2 bytes	Aftertreatment 2 Diesel Particulate Filter Differential Pressure	3285
7.1	5 bits	Aftertreatment 2 Exhaust Gas Temperature 2 Preliminary FMI	3286
7.6-8.1	5 bits	Aftertreatment 2 Diesel Particulate Filter Delta Pressure Preliminary FMI	3287
8.3	5 bits	Aftertreatment 2 Diesel Particulate Filter Intermediate Gas Temperature Preliminary FMI	3288

**(R) PGN 64944     Aftertreatment 2 Outlet Gas 2****AT2OG2**

The purpose of this PGN is to group the aftertreatment outlet gas temperature messages for bank 2.

Transmission Repetition Rate: 500 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 176     PGN Supporting Information: See Appendix D - PGN 64948  
Default Priority: 6  
Parameter Group Number: 64944 (0x00FDB0)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Aftertreatment 2 Exhaust Gas Temperature 3	3279
3-4	2 bytes	Aftertreatment 2 Diesel Particulate Filter Outlet Gas Temperature	3280
5.1	5 bits	Aftertreatment 2 Exhaust Gas Temperature 3 Preliminary FMI	3281
6.1	5 bits	Aftertreatment 2 Diesel Particulate Filter Exhaust Gas Temperature Preliminary FMI	3282

**(R) PGN 64945      Aftertreatment 2 Intake Gas 2****AT2IG2**

The purpose of this PGN is to group the aftertreatment intake gas temperature messages for bank 2.

Transmission Repetition Rate: 500 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 177      PGN Supporting Information: See Appendix D - PGN 64948  
 Default Priority: 6  
 Parameter Group Number: 64945 (0x00FDB1)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Aftertreatment 2 Exhaust Gas Temperature 1	3275
3-4	2 bytes	Aftertreatment 2 Diesel Particulate Filter Intake Gas Temperature	3276
5.1	5 bits	Aftertreatment 2 Exhaust Gas Temperature 1 Preliminary FMI	3277
6.1	5 bits	Aftertreatment 2 Diesel Particulate Filter Intake Gas Temperature Preliminary FMI	3278

**(R) PGN 64946      Aftertreatment 1 Intermediate Gas****AT1IMG**

The purpose of this PGN is to group the aftertreatment intermediate gas temperature and pressure messages.

Note: The 5 bits of SPN 3253 are positioned into the data field in the following manner. The 2 most significant bits are placed in bits 2-1 of byte 8 such that the most significant bit of SPN 3253 located at byte 8 bit 2, and the 3 least significant bits are placed in bits 8-6 of byte 7 such that the least significant bit of SPN 3253 located at byte 7 bit 6.

Transmission Repetition Rate: 500 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 178      PGN Supporting Information: See Appendix D - PGN 64948  
 Default Priority: 6  
 Parameter Group Number: 64946 (0x00FDB2)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Aftertreatment 1 Exhaust Gas Temperature 2	3249
3-4	2 bytes	Aftertreatment 1 Diesel Particulate Filter Intermediate Gas Temperature	3250
5-6	2 bytes	Aftertreatment 1 Diesel Particulate Filter Differential Pressure	3251
7.1	5 bits	Aftertreatment 1 Exhaust Gas Temperature 2 Preliminary FMI	3252
7.6-8.1	5 bits	Aftertreatment 1 Diesel Particulate Filter Delta Pressure Preliminary FMI	3253
8.3	5 bits	Aftertreatment 1 Diesel Particulate Filter Intermediate Gas Temperature Preliminary FMI	3254

**(R) PGN 64947     Aftertreatment 1 Outlet Gas 2****AT1OG2**

The purpose of this PGN is to group the aftertreatment outlet gas temperature messages.

Transmission Repetition Rate: 500 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 179                      PGN Supporting Information: See Appendix D - PGN 64948  
Default Priority: 6  
Parameter Group Number: 64947 (0x00FDB3)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Aftertreatment 1 Exhaust Gas Temperature 3	3245
3-4	2 bytes	Aftertreatment 1 Diesel Particulate Filter Outlet Gas Temperature	3246
5.1	5 bits	Aftertreatment 1 Exhaust Gas Temperature 3 Preliminary FMI	3247
6.1	5 bits	Aftertreatment 1 Diesel Particulate Filter Outlet Exhaust Gas Temperature Preliminary FMI	3248

**(R) PGN 64948     Aftertreatment 1 Intake Gas 2****AT1IG2**

The purpose of this PGN is to group the aftertreatment intake gas temperature messages for bank 1.

Transmission Repetition Rate: 500 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 180                      PGN Supporting Information: See Appendix D - PGN 64948  
Default Priority: 6  
Parameter Group Number: 64948 (0x00FDB4)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Aftertreatment 1 Exhaust Gas Temperature 1	3241
3-4	2 bytes	Aftertreatment 1 Diesel Particulate Filter Intake Gas Temperature	3242
5.1	5 bits	Aftertreatment 1 Exhaust Gas Temperature 1 Preliminary FMI	3243
6.1	5 bits	Aftertreatment 1 Diesel Particulate Filter Intake Gas Temperature Preliminary FMI	3244

**PGN 64953 Tire Pressure Reference Information****TPRI**

Information on actual tire pressure reference value for monitoring.

NOTE—Message has to be repeated as necessary to transmit all available information. This method of location identification requires individual SPNs to be assigned to report failures specific to each individual component (i.e. each tire, each axle, etc.).

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 185 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64953 (0x00FDB9)

Start Position	Length	Parameter Name	SPN
1	8 bits	Tire Location	3190
2	1 byte	Reference Tire Pressure	3191

**PGN 64954 Farebox Status****TR6**

Used to report alarms of the fare collection unit.

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 186 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64954 (0x00FDBA)

Start Position	Length	Parameter Name	SPN
1.1	2 bits	Farebox Emergency Status	3179
2.1	7 bits	Farebox Alarm Identifier	3181

**PGN 64955      Farebox Point of Sale****TR5**

Used to report stop level point of sale detail.

Transmission Repetition Rate: On request  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 187      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64955 (0x00FDBB)

Start Position	Length	Parameter Name	SPN
1.1	4 bits	Transaction Type	3170
1.5	4 bits	Passenger Type	3171
2.1	4 bits	Type of Fare	3176
2.5	4 bits	Payment Details	3177
3.1	4 bits	Fare Validity	3165
3.5	4 bits	Pass Category	3166
4.1	5 bits	Initial Fare Agency	3167
5.1	3 bits	Type of Service	3172
5.4	5 bits	Transfer Type	3173
6, 7.1	12 bits	Route Number	3169
8	1 byte	Transfer Sold	3168

**PGN 64956      Farebox Service Detail****TR4**

Used to identify service, assignments, and fare preset detail of the fare collection unit.

Transmission Repetition Rate: On request  
 Data Length: 15  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 188      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64956 (0x00FDBC)

Start Position	Length	Parameter Name	SPN
01.1	2 bits	Farebox Service Status	3178
01.3	3 bits	Trip Status	3180
02.1	4 bits	Trip Direction	3174
03	8 bits	Fare Presets	3175
04-05	2 bytes	Trip Number	3159
06-07	2 bytes	Pattern Number	3161
08-09	2 bytes	Assigned Route	3160
10-11	2 bytes	Assigned Run	3162
12-13	2 bytes	Assigned Block	3163
14-15	2 bytes	Driver's farebox security code	3164

**PGN 64957      Signal Preemption****TR3**

Status and configuration of the device used for intersection preemption.

Transmission Repetition Rate: On request  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 189      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64957 (0x00FDBD)

Start Position	Length	Parameter Name	SPN
1.3	2 bits	Range Code Enable	3081
1.5	2 bits	Transit Route ID Usage	3080
1.7	2 bits	Intersection Preemption Request/Response	3079
2.1	4 bits	Priority of Response Sent by Emitter	3084
2.5	2 bits	Transit Door Enable	3083
2.7	2 bits	Strobe Activation Control Status	3082
3,4	2 bytes	Vehicle ID	3085

**PGN 64958      Transit Route****TR1**

The current route assigned to this transit vehicle. The transit route information may be entered into different devices by different authorities (fare collection, radio log, unit control panel, etc.).

Transmission Repetition Rate: On request  
 Data Length: variable  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 190      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64958 (0x00FDBE)

Start Position	Length	Parameter Name	SPN
1	1 byte	Agency	3078
2	1 byte	Number of bytes in the Transit Assigned Route Identity	3071
3	1 byte	Number of bytes in the Transit Assigned Run Identity	3072
4	1 byte	Number of bytes in the Transit Assigned Block Identity	3073
5 to A	Variable - up to 100 bytes	Transit Assigned Route Identity	3074
A+1 to B	Variable - up to 100 bytes	Transit Assigned Run Identity	3075
B+1 to C	Variable - up to 100 bytes	Transit Assigned Block Identity	3076

**PGN 64959      Transit Milepost****TR2**

Identification of a transit route milepost

Transmission Repetition Rate: On request  
Data Length: variable  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 191      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64959 (0x00FDBF)

Start Position	Length	Parameter Name	SPN
1	1 byte	Number of bytes in the Milepost Identification	3070
2 to n	Variable - up to 100 bytes	Milepost Identification	509

**PGN 64960      Passenger Counter****TR7**

Used to notify the transit link devices of real-time boarding and exiting passengers or to indicate the total number of passengers on vehicle referenced to the last transit stop.

Also transmits information on the use status of the vehicle.

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 192      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64960 (0x00FDC0)

Start Position	Length	Parameter Name	SPN
1	8 bits	Type of Passenger Count	3043
2	1 byte	Patron Count	3047
3.1	2 bits	Silent Alarm Status	3044
3.3	2 bits	Vehicle Use Status	3045
3.5	2 bits	Transit Run Status	3046

**PGN 64961      Engine Fluid Level/Pressure 3****EFL/P3**

3rd PGN which identifies parameters that are either measuring various pressures within the engine or identifying engine fluid levels

Transmission Repetition Rate: 500 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 193      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64961 (0x00FDC1)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Engine Intake Valve Actuation System Oil Pressure	2948
3	1 byte	Engine Exhaust Gas Recirculation 1 Intake Pressure	3358
4-5	2 bytes	Engine Exhaust Valve Actuation System Oil Pressure	4287
6	1 byte	Engine Exhaust Gas Recirculation 1 Outlet Pressure	5019

**(R) PGN 64964      Electronic Brake Controller 5****EBC5**

Used for information on brake control.

Transmission Repetition Rate: 100 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 196      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64964 (0x00FDC4)

Start Position	Length	Parameter Name	SPN
1.1	2 bits	Brake Temperature Warning	3839
1.3	3 bits	Halt brake mode	2913
1.6	3 bits	Hill holder mode	2912
2.1	2 bits	Foundation Brake Use	2919
2.3	2 bits	XBR System State	2917
2.5	4 bits	XBR Active Control Mode	2918
3	1 byte	XBR Acceleration Limit	2921
4.1	2 bits	Parking Brake Actuator Fully Activated	5275



**PGN 64965****ECU Identification Information****ECUID**

Message for reporting identification and information about the physical ECU and its hardware, such as the ECU's part number, serial number, build date, etc. Information about the software within the ECU should be reported using the Software Identification PGN 65242 and/or DM19.

NOTE - The fields in this message are optional and separated by an ASCII "\*\*\*". It is not necessary to include parametric data for all fields; however, the delimiter ("\*\*") is always required. An ASCII "\*\*\*" is required at the end of the last included field, even if there is only one ECU identification designator. Any additional ECU identification fields defined in the future will be appended at the end, each separated by an ASCII "\*\*\*" as a delimiter.

Transmission Repetition Rate: On request  
 Data Length: Variable  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 197 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64965 (0x00FDC5)

Start Position	Length	Parameter Name	SPN
a	Variable - up to 200 bytes followed by an "***" delimiter	ECU Part Number	2901
b	Variable - up to 200 bytes followed by an "***" delimiter	ECU Serial Number	2902
c	Variable - up to 200 bytes followed by an "***" delimiter	ECU Location	2903
d	Variable - up to 200 bytes followed by an "***" delimiter	ECU Type	2904
e	Variable - up to 200 bytes followed by an "***" delimiter	ECU Manufacturer Name	4304

**PGN 64966****Cold Start Aids**

Cold start aid information and settings.

Transmission Repetition Rate: As required  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 198 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64966 (0x00FDC6)

Start Position	Length	Parameter Name	SPN
1.1	2 bits	Engine Start Enable Device 1	626
1.3	2 bits	Engine Start Enable Device 2	1804
2.1	4 bits	Engine Start Enable Device 1 Configuration	2899
2.5	4 bits	Engine Start Enable Device 2 Configuration	2898

**PGN 64967 Off-Highway Engine Control Selection States****OHCSS**

Reports the states of off-highway engine control modes, as they apply to different modes of engine operation which may be used to aid particular working environments. These states provide the controls feedback for PGN 64971 which provides the operator inputs to the controller.

Transmission Repetition Rate: 0.5 s  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 199 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64967 (0x00FDC7)

Start Position	Length	Parameter Name	SPN
1.1	2 bits	Engine Auxiliary Governor State	2896
1.3	2 bits	Engine Multi-Unit Sync State	2890
1.5	2 bits	Engine Alternate Low Idle Select State	2891
2	8 bits	Engine Alternate Rating Select State	2888
3.1	4 bits	Engine Alternate Droop Accelerator 1 Select State	2889
3.5	4 bits	Engine Alternate Droop Accelerator 2 Select State	2893
4.1	4 bits	Engine Alternate Droop Remote Accelerator Select State	2894
4.5	4 bits	Engine Alternate Droop Auxiliary Input Select State	2895

**PGN 64968 Operator Primary Intermediate Speed Control state****ISCS**

The Operator Primary Intermediate Speed Control State is used to provide the controller feedback to indicate the controls state achieved.

Transmission Repetition Rate: 1 s  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 200 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64968 (0x00FDC8)

Start Position	Length	Parameter Name	SPN
1.1	4 bits	Engine Operator Primary Intermediate Speed Select State	2892

**PGN 64969 Electronic Control Module Information****CMI**

Information relating to electronic control modules

Transmission Repetition Rate: As required  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 201 PGN Supporting Information:  
 Default Priority: 7  
 Parameter Group Number: 64969 (0x00FDC9)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Total Count of Configuration Changes Made	2887

**PGN 64970 Intermediate Speed Control****ISC**

The Intermediate Speed Control is widely used in the Industrial application to control the engine to an intermediate speed setting which can bypass the accelerator position control. An example of this operation would be in an agricultural application where an external device is connected to an output shaft from the engine which must then be controlled to a constant speed. This is accomplished by activating a switch setting, thus eliminating the need for the operator to attempt to control this speed with the accelerator position.

Transmission Repetition Rate: 1 s  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 202 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64970 (0x00FDCA)

Start Position	Length	Parameter Name	SPN
1.1	4 bits	Engine Operator Primary Intermediate Speed Select	2880

**PGN 64971 Off-Highway Engine Control Selection****OHECS**

Allows for the selection of off-highway engine control modes, as they apply to different modes of engine operation which may be used to aid particular working environments. By offering characteristics suitable for the work in hand, the operator may select the desired mode (e.g. economy fuel ratings, droop settings, alternate idle points, multiple engine synchronization, etc.) to maximize performance under given conditions. The operator selects these inputs via hardwire switch operation, whereby an overall system control communicates the information to the engine controller.

Transmission Repetition Rate: 500 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 203 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64971 (0x00FDCB)

Start Position	Length	Parameter Name	SPN
1.1	2 bits	Engine Auxiliary Governor Switch	2884
1.3	2 bits	Engine Synchronization Switch	1377
1.5	2 bits	Engine Alternate Low Idle Switch	2883
2	1 byte	Engine Alternate Rating Select	2882
3.1	4 bits	Engine Alternate Droop Accelerator 1 Select	2881
3.5	4 bits	Engine Alternate Droop Accelerator 2 Select	2879
4.1	4 bits	Engine Alternate Droop Remote Accelerator Select	2886
4.5	4 bits	Engine Alternate Droop Auxiliary Input Select	2885

**PGN 64972 Operators External Light Controls Message****OEL**

The message containing the information about the position of the operator's external light control switch(s). Including switches for the Headlights, turn signals, hazard light, clearance lights, marker lights, etc.

Transmission Repetition Rate: Every 1 s and on change of switch state but no faster than every 100 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 204 PGN Supporting Information:  
Default Priority: 3  
Parameter Group Number: 64972 (0x00FDCC)

Start Position	Length	Parameter Name	SPN
1.1	4 bits	Work Light Switch	2873
1.5	4 bits	Main Light Switch	2872
2.1	4 bits	Turn Signal Switch	2876
2.5	2 bits	Hazard Light Switch	2875
2.7	2 bits	High-Low Beam Switch	2874
3	1 byte	Operators Desired Back-light	2878
4-5	2 bytes	Operators Desired - Delayed Lamp Off Time	2877

**PGN 64973 Operator Wiper and Washer Controls Message****OWW**

Message for items related to the operators controls for the window wipers and washers on the front and rear cab windows

Transmission Repetition Rate: 200 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 205 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64973 (0x00FDCD)

Start Position	Length	Parameter Name	SPN
1.1	4 bits	Front Non-operator Wiper Switch	2864
1.5	4 bits	Front Operator Wiper Switch	2863
2.5	4 bits	Rear Wiper Switch	2865
3	1 byte	Front Operator Wiper Delay Control	2869
4	1 byte	Front Non-operator Wiper Delay Control	2870
5	1 byte	Rear Wiper Delay Control	2871
6.3	3 bits	Front Non-operator Washer Switch	2867
6.6	3 bits	Front Operator Washer Switch	2866
7.6	3 bits	Rear Washer Function	2868

**(R) PGN 64976 Intake/Exhaust Conditions 2****IC2**

Intake/Exhaust Conditions 2 is a second PGN conveying this type of engine information. Also see PGN 65270.

Transmission Repetition Rate: 0.5 s  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 208 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64976 (0x00FDD0)

Start Position	Length	Parameter Name	SPN
1	1 byte	Engine Air Filter 2 Differential Pressure	2809
2	1 byte	Engine Air Filter 3 Differential Pressure	2810
3	1 byte	Engine Air Filter 4 Differential Pressure	2811
4	1 byte	Engine Intake Manifold #2 Pressure	3562
5	1 byte	Engine Intake Manifold #1 Absolute Pressure	3563
6-7	2 bytes	Engine Intake Manifold #1 Absolute Pressure (High Resolution)	4817
8	1 byte	Engine Intake Manifold 2 Absolute Pressure	5422

**PGN 64977 FMS-standard Interface Identity/Capabilities****FMS**

Information which specifies the capabilities of the Fleet Management System (FMS) - standard interface device. This PGN typically is sourced from the network interconnect FMS - standard interface device.

Transmission Repetition Rate: 10 s  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 209 PGN Supporting Information:  
 Default Priority: 7  
 Parameter Group Number: 64977 (0x00FDD1)

Start Position	Length	Parameter Name	SPN
1.1	2 bits	FMS-standard Diagnostics Supported	2804
1.3	2 bits	FMS-standard Requests Supported	2805
2-5	4 bytes	FMS-standard SW-version supported.	2806

**PGN 64978 ECU Performance****EP**

Message used to transfer ECU performance parameters.

Transmission Repetition Rate: On request  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 253  
 PDU Specific: 210 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 64978 (0x00FDD2)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Keep-Alive Battery Consumption	2803
3	1 byte	Data Memory Usage	2802

**PGN 64979 Turbocharger Information 6****TCI6**

Transmission Repetition Rate: 1 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 211 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64979 (0x00FDD3)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Engine Turbocharger 1 Compressor Outlet Temperature	2629
3-4	2 bytes	Engine Turbocharger 2 Compressor Outlet Temperature	2799
5-6	2 bytes	Engine Turbocharger 3 Compressor Outlet Temperature	2800
7-8	2 bytes	Engine Turbocharger 4 Compressor Outlet Temperature	2801

**PGN 64980 Cab Message 3****CM3**

Provides information from Cab mounted operator inputs.

Transmission Repetition Rate: Every 10 s and on change of state but no faster than every 100 ms. Grandfathered definition for systems that implemented this message prior to July, 2010: On change or every 10 s

Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 212 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64980 (0x00FDD4)

Start Position	Length	Parameter Name	SPN
1.1	3 bits	Transfer Case Selector Switch	2796
2.1	2 bits	Fifth Wheel Release Control	3314
2.3	2 bits	Fifth Wheel Release Control Security Lockout	3315
3.1	2 bits	Transmission Oil Level Request	3809

**(R) PGN 64981      Electronic Engine Controller 5****EEC5**

Engine related parameters

Transmission Repetition Rate:      On request  
Data Length:                              8  
Extended Data Page:                    0  
Data Page:                                0  
PDU Format:                               253  
PDU Specific:                            213                    PGN Supporting Information:  
Default Priority:                        6  
Parameter Group Number:              64981 (0x00FDD5)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Engine Turbocharger 1 Calculated Turbine Intake Temperature	2789
3-4	2 bytes	Engine Turbocharger 1 Calculated Turbine Outlet Temperature	2790
5-6	2 bytes	Engine Exhaust Gas Recirculation 1 (EGR1) Valve Control	2791
7.1	2 bits	Engine Variable Geometry Turbocharger (VGT) Air Control Shutoff Valve	2792
7.5	2 bits	Engine Variable Geometry Turbocharger 1 Control Mode	5457
8	1 byte	Engine Variable Geometry Turbocharger (VGT) 1 Actuator Position	2795

**PGN 64982 Basic Joystick Message 1****BJM1**

Used to transfer information about the measured status of the 1st 2 axes and up to 12 buttons of a joystick. Additional handle information is available in the Expanded Joystick Message.

10-bit position parameters are broadcast over 2 bytes. The eight most significant bits are transmitted in the second byte, with the most significant bit at bit 8. The two least significant bits are transmitted in the first byte in bit positions 7 and 8, with the most significant of the two bits at bit 8.

10-bit position SPN	Location in PGN	
Bit 10	Byte n	Bit 8
Bit 9		Bit 7
Bit 8		Bit 6
Bit 7		Bit 5
Bit 6		Bit 4
Bit 5		Bit 3
Bit 4		Bit 2
Bit 3		Bit 1
Bit 2	Byte (n-1)	Bit 8
Bit 1		Bit 7

Transmission Repetition Rate:	Every 100 ms and on change of state but no faster than every 20 ms. Grandfathered definition for systems that implemented this message prior to July, 2010: 100 ms or on change, not to exceed 20 ms	
Data Length:	8	
Extended Data Page:	0	
Data Page:	0	
PDU Format:	253	
PDU Specific:	214	PGN Supporting Information:
Default Priority:	3	
Parameter Group Number:	64982 (0x00FDD6)	

Start Position	Length	Parameter Name	SPN
1.1	2 bits	Joystick 1 X-Axis Neutral Position Status	2675
1.3	2 bits	Joystick 1 X-Axis Lever Left Negative Position Status	2670
1.5	2 bits	Joystick 1 X-Axis Lever Right Positive Position Status	2665
1.7-2	10 bits	Joystick 1 X-Axis Position	2660
3.1	2 bits	Joystick 1 Y-Axis Neutral Position Status	2676
3.3	2 bits	Joystick 1 Y-Axis Lever Back Negative Position Status	2671
3.5	2 bits	Joystick 1 Y-Axis Lever Forward Positive Position Status	2666
3.7-4	10 bits	Joystick 1 Y-Axis Position	2661
5.5	2 bits	Joystick 1 Y-Axis Detent Position Status	2681
5.7	2 bits	Joystick 1 X-Axis Detent Position Status	2680
6.1	2 bits	Joystick 1 Button 4 Pressed Status	2688
6.3	2 bits	Joystick 1 Button 3 Pressed Status	2687
6.5	2 bits	Joystick 1 Button 2 Pressed Status	2686
6.7	2 bits	Joystick 1 Button 1 Pressed Status	2685
7.1	2 bits	Joystick 1 Button 8 Pressed Status	2692
7.3	2 bits	Joystick 1 Button 7 Pressed Status	2691
7.5	2 bits	Joystick 1 Button 6 Pressed Status	2690
7.7	2 bits	Joystick 1 Button 5 Pressed Status	2689
8.1	2 bits	Joystick 1 Button 12 Pressed Status	2696
8.3	2 bits	Joystick 1 Button 11 Pressed Status	2695
8.5	2 bits	Joystick 1 Button 10 Pressed Status	2694
8.7	2 bits	Joystick 1 Button 9 Pressed Status	2693



**PGN 64983****Extended Joystick Message 1****EJM1**

Used to transfer information about the measured status of three additional axes of a joystick and switches of the joystick grip or handle. The joystick axial motion information is available in the Basic Joystick Message.

10-bit position parameters are broadcast over 2 bytes. The eight most significant bits are transmitted in the second byte, with the most significant bit at bit 8. The two least significant bits are transmitted in the first byte in bit positions 7 and 8, with the most significant of the two bits at bit 8.

10-bit position SPN	Location in PGN	
Bit 10	Byte n	Bit 8
Bit 9		Bit 7
Bit 8		Bit 6
Bit 7		Bit 5
Bit 6		Bit 4
Bit 5		Bit 3
Bit 4		Bit 2
Bit 3		Bit 1
Bit 2	Byte (n-1)	Bit 8
Bit 1		Bit 7

Note: The term Grip used here simply refers to another set of axes separate from the previously mentioned X and Y Axis. This additional set of axes could in some cases be grip mounted sensors as opposed to the sensors mounted at the base of the handle.

Transmission Repetition Rate:	Every 100 ms and on change of state but no faster than every 20 ms. Grandfathered definition for systems that implemented this message prior to July, 2010: 100 ms or on change, not to exceed 20 ms		
Data Length:	8		
Extended Data Page:	0		
Data Page:	0		
PDU Format:	253		
PDU Specific:	215	PGN Supporting Information:	
Default Priority:	3		
Parameter Group Number:	64983 (0x00FDD7)		

Start Position	Length	Parameter Name	SPN
1.1	2 bits	Joystick 1 Grip X-Axis Neutral Position Status	2677
1.3	2 bits	Joystick 1 Grip X-Axis Lever Left Negative Position Status	2672
1.5	2 bits	Joystick 1 Grip X-Axis Lever Right Positive Position Status	2667
1.7-2	10 bits	Joystick 1 Grip X-Axis Position	2662
3.1	2 bits	Joystick 1 Grip Y-Axis Neutral Position Status	2678
3.3	2 bits	Joystick 1 Grip Y-Axis Lever Back Negative Position Status	2673
3.5	2 bits	Joystick 1 Grip Y-Axis Lever Forward Positive Position Status	2668
3.7-4	10 bits	Joystick 1 Grip Y-Axis Position	2663
5.1	2 bits	Joystick 1 Theta-Axis Neutral Position Status	2679
5.3	2 bits	Joystick 1 Theta-Axis Counter Clockwise Negative Position Status	2674
5.5	2 bits	Joystick 1 Theta-Axis Clockwise Positive Position Status	2669
5.7-6	10 bits	Joystick 1 Theta-Axis Position	2664
7.3	2 bits	Joystick 1 Theta-Axis Detent Position Status	2684
7.5	2 bits	Joystick 1 Grip Y-Axis Detent Position Status	2683
7.7	2 bits	Joystick 1 Grip X-Axis Detent Position Status	2682

**PGN 64984****Basic Joystick Message 2****BJM2**

Used to transfer information about the measured status of the 1st 2 axes and up to 12 buttons of a joystick. Additional handle information is available in the Expanded Joystick Message.

10-bit position parameters are broadcast over 2 bytes. The eight most significant bits are transmitted in the second byte, with the most significant bit at bit 8. The two least significant bits are transmitted in the first byte in bit positions 7 and 8, with the most significant of the two bits at bit 8.

10-bit position SPN	Location in PGN	
Bit 10	Byte n	Bit 8
Bit 9		Bit 7
Bit 8		Bit 6
Bit 7		Bit 5
Bit 6		Bit 4
Bit 5		Bit 3
Bit 4		Bit 2
Bit 3		Bit 1
Bit 2	Byte (n-1)	Bit 8
Bit 1		Bit 7

Transmission Repetition Rate:	Every 100 ms and on change of state but no faster than every 20 ms. Grandfathered definition for systems that implemented this message prior to July, 2010: 100 ms or on change, not to exceed 20 ms	
Data Length:	8	
Extended Data Page:	0	
Data Page:	0	
PDU Format:	253	
PDU Specific:	216	PGN Supporting Information:
Default Priority:	3	
Parameter Group Number:	64984 (0x00FDD8)	

Start Position	Length	Parameter Name	SPN
1.1	2 bits	Joystick 2 X-Axis Neutral Position Status	2712
1.3	2 bits	Joystick 2 X-Axis Lever Left Negative Position Status	2707
1.5	2 bits	Joystick 2 X-Axis Lever Right Positive Position Status	2702
1.7-2	10 bits	Joystick 2 X-Axis Position	2697
3.1	2 bits	Joystick 2 Y-Axis Neutral Position Status	2713
3.3	2 bits	Joystick 2 Y-Axis Lever Back Negative Position Status	2708
3.5	2 bits	Joystick 2 Y-Axis Lever Forward Positive Position Status	2703
3.7-4	10 bits	Joystick 2 Y-Axis Position	2698
5.5	2 bits	Joystick 2 Y-Axis Detent Position Status	2718
5.7	2 bits	Joystick 2 X-Axis Detent Position Status	2717
6.1	2 bits	Joystick 2 Button 4 Pressed Status	2725
6.3	2 bits	Joystick 2 Button 3 Pressed Status	2724
6.5	2 bits	Joystick 2 Button 2 Pressed Status	2723
6.7	2 bits	Joystick 2 Button 1 Pressed Status	2722
7.1	2 bits	Joystick 2 Button 8 Pressed Status	2729
7.3	2 bits	Joystick 2 Button 7 Pressed Status	2728
7.5	2 bits	Joystick 2 Button 6 Pressed Status	2727
7.7	2 bits	Joystick 2 Button 5 Pressed Status	2726
8.1	2 bits	Joystick 2 Button 12 Pressed Status	2733
8.3	2 bits	Joystick 2 Button 11 Pressed Status	2732
8.5	2 bits	Joystick 2 Button 10 Pressed Status	2731
8.7	2 bits	Joystick 2 Button 9 Pressed Status	2730

**PGN 64985 Extended Joystick Message 2****EJM2**

Used to transfer information about the measured status of three additional axes of a joystick and switches of the joystick grip or handle. The joystick axial motion information is available in the Basic Joystick Message.

10-bit position parameters are broadcast over 2 bytes. The eight most significant bits are transmitted in the second byte, with the most significant bit at bit 8. The two least significant bits are transmitted in the first byte in bit positions 7 and 8, with the most significant of the two bits at bit 8.

10-bit position SPN	Location in PGN	
Bit 10	Byte n	Bit 8
Bit 9		Bit 7
Bit 8		Bit 6
Bit 7		Bit 5
Bit 6		Bit 4
Bit 5		Bit 3
Bit 4		Bit 2
Bit 3		Bit 1
Bit 2	Byte (n-1)	Bit 8
Bit 1		Bit 7

Note: The term Grip used here simply refers to another set of axes separate from the previously mentioned X and Y Axis. This additional set of axes could in some cases be grip mounted sensors as opposed to the sensors mounted at the base of the handle.

Transmission Repetition Rate:	Every 100 ms and on change of state but no faster than every 20 ms. Grandfathered definition for systems that implemented this message prior to July, 2010: 100 ms or on change, not to exceed 20 ms		
Data Length:	8		
Extended Data Page:	0		
Data Page:	0		
PDU Format:	253		
PDU Specific:	217	PGN Supporting Information:	
Default Priority:	3		
Parameter Group Number:	64985 (0x00FDD9)		

Start Position	Length	Parameter Name	SPN
1.1	2 bits	Joystick 2 Grip X-Axis Neutral Position Status	2714
1.3	2 bits	Joystick 2 Grip X-Axis Lever Left Negative Position Status	2709
1.5	2 bits	Joystick 2 Grip X-Axis Lever Right Positive Position Status	2704
1.7-2	10 bits	Joystick 2 Grip X-Axis Position	2699
3.1	2 bits	Joystick 2 Grip Y-Axis Neutral Position Status	2715
3.3	2 bits	Joystick 2 Grip Y-Axis Lever Back Negative Position Status	2710
3.5	2 bits	Joystick 2 Grip Y-Axis Lever Forward Positive Position Status	2705
3.7-4	10 bits	Joystick 2 Grip Y-Axis Position	2700
5.1	2 bits	Joystick 2 Theta-Axis Neutral Position Status	2716
5.3	2 bits	Joystick 2 Theta-Axis Counter Clockwise Negative Position Status	2711
5.5	2 bits	Joystick 2 Theta-Axis Clockwise Positive Position Status	2706
5.7-6	10 bits	Joystick 2 Theta-Axis Position	2701
7.3	2 bits	Joystick 2 Theta-Axis Detent Position Status	2721
7.5	2 bits	Joystick 2 Grip Y-Axis Detent Position Status	2720
7.7	2 bits	Joystick 2 Grip X-Axis Detent Position Status	2719

**PGN 64986****Basic Joystick Message 3****BJM3**

Used to transfer information about the measured status of the 1st 2 axes and up to 12 buttons of a joystick. Additional handle information is available in the Expanded Joystick Message.

10-bit position parameters are broadcast over 2 bytes. The eight most significant bits are transmitted in the second byte, with the most significant bit at bit 8. The two least significant bits are transmitted in the first byte in bit positions 7 and 8, with the most significant of the two bits at bit 8.

10-bit position SPN	Location in PGN	
Bit 10	Byte n	Bit 8
Bit 9		Bit 7
Bit 8		Bit 6
Bit 7		Bit 5
Bit 6		Bit 4
Bit 5		Bit 3
Bit 4		Bit 2
Bit 3		Bit 1
Bit 2	Byte (n-1)	Bit 8
Bit 1		Bit 7

Transmission Repetition Rate:	Every 100 ms and on change of state but no faster than every 20 ms. Grandfathered definition for systems that implemented this message prior to July, 2010: 100 ms or on change, not to exceed 20 ms	
Data Length:	8	
Extended Data Page:	0	
Data Page:	0	
PDU Format:	253	
PDU Specific:	218	PGN Supporting Information:
Default Priority:	3	
Parameter Group Number:	64986 (0x00FDDA)	

Start Position	Length	Parameter Name	SPN
1.1	2 bits	Joystick 3 X-Axis Neutral Position Status	2749
1.3	2 bits	Joystick 3 X-Axis Lever Left Negative Position Status	2744
1.5	2 bits	Joystick 3 X-Axis Lever Right Positive Position Status	2739
1.7-2	10 bits	Joystick 3 X-Axis Position	2734
3.1	2 bits	Joystick 3 Y-Axis Neutral Position Status	2750
3.3	2 bits	Joystick 3 Y-Axis Lever Back Negative Position Status	2745
3.5	2 bits	Joystick 3 Y-Axis Lever Forward Positive Position Status	2740
3.7-4	10 bits	Joystick 3 Y-Axis Position	2735
5.5	2 bits	Joystick 3 Y-Axis Detent Position Status	2755
5.7	2 bits	Joystick 3 X-Axis Detent Position Status	2754
6.1	2 bits	Joystick 3 Button 4 Pressed Status	2762
6.3	2 bits	Joystick 3 Button 3 Pressed Status	2761
6.5	2 bits	Joystick 3 Button 2 Pressed Status	2760
6.7	2 bits	Joystick 3 Button 1 Pressed Status	2759
7.1	2 bits	Joystick 3 Button 8 Pressed Status	2766
7.3	2 bits	Joystick 3 Button 7 Pressed Status	2765
7.5	2 bits	Joystick 3 Button 6 Pressed Status	2764
7.7	2 bits	Joystick 3 Button 5 Pressed Status	2763
8.1	2 bits	Joystick 3 Button 12 Pressed Status	2770
8.3	2 bits	Joystick 3 Button 11 Pressed Status	2769
8.5	2 bits	Joystick 3 Button 10 Pressed Status	2768
8.7	2 bits	Joystick 3 Button 9 Pressed Status	2767

**PGN 64987****Extended Joystick Message 3****EJM3**

Used to transfer information about the measured status of three additional axes of a joystick and switches of the joystick grip or handle. The joystick axial motion information is available in the Basic Joystick Message.

10-bit position parameters are broadcast over 2 bytes. The eight most significant bits are transmitted in the second byte, with the most significant bit at bit 8. The two least significant bits are transmitted in the first byte in bit positions 7 and 8, with the most significant of the two bits at bit 8.

10-bit position SPN	Location in PGN	
Bit 10	Byte n	Bit 8
Bit 9		Bit 7
Bit 8		Bit 6
Bit 7		Bit 5
Bit 6		Bit 4
Bit 5		Bit 3
Bit 4		Bit 2
Bit 3		Bit 1
Bit 2	Byte (n-1)	Bit 8
Bit 1		Bit 7

Note: The term Grip used here simply refers to another set of axes separate from the previously mentioned X and Y Axis. This additional set of axes could in some cases be grip mounted sensors as opposed to the sensors mounted at the base of the handle.

Transmission Repetition Rate:	Every 100 ms and on change of state but no faster than every 20 ms. Grandfathered definition for systems that implemented this message prior to July, 2010: 100 ms or on change, not to exceed 20 ms		
Data Length:	8		
Extended Data Page:	0		
Data Page:	0		
PDU Format:	253		
PDU Specific:	219	PGN Supporting Information:	
Default Priority:	3		
Parameter Group Number:	64987 (0x00FDDB)		

Start Position	Length	Parameter Name	SPN
1.1	2 bits	Joystick 3 Grip X-Axis Neutral Position Status	2751
1.3	2 bits	Joystick 3 Grip X-Axis Lever Left Negative Position Status	2746
1.5	2 bits	Joystick 3 Grip X-Axis Lever Right Positive Position Status	2741
1.7-2	10 bits	Joystick 3 Grip X-Axis Position	2736
3.1	2 bits	Joystick 3 Grip Y-Axis Neutral Position Status	2752
3.3	2 bits	Joystick 3 Grip Y-Axis Lever Back Negative Position Status	2747
3.5	2 bits	Joystick 3 Grip Y-Axis Lever Forward Positive Position Status	2742
3.7-4	10 bits	Joystick 3 Grip Y-Axis Position	2737
5.1	2 bits	Joystick 3 Theta-Axis Neutral Position Status	2753
5.3	2 bits	Joystick 3 Theta-Axis Counter Clockwise Negative Position Status	2748
5.5	2 bits	Joystick 3 Theta-Axis Clockwise Positive Position Status	2743
5.7-6	10 bits	Joystick 3 Theta-Axis Position	2738
7.3	2 bits	Joystick 3 Theta-Axis Detent Position Status	2758
7.5	2 bits	Joystick 3 Grip Y-Axis Detent Position Status	2757
7.7	2 bits	Joystick 3 Grip X-Axis Detent Position Status	2756

**PGN 64988 Marine Control Information****MCI**

This messages contains marine vessel control information for the engine

Transmission Repetition Rate: 1 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 220 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64988 (0x00FDDC)

Start Position	Length	Parameter Name	SPN
1.1	4 bits	Engine Throttle Synchronization Mode Status	2615
1.5	2 bits	Trolling Mode Status	2616
1.7	2 bits	Slow Vessel Mode Status	2617

**PGN 64991 Front Wheel Drive Status****FWD**

Front wheel drive ECU information

Transmission Repetition Rate: 0.5 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 223 PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 64991 (0x00FDDF)

Start Position	Length	Parameter Name	SPN
1.1	2 bits	Front Wheel Drive Actuator Status	2612

**PGN 64992 Ambient Conditions 2****AMB2**

This message contains measurement and configuration information about the vehicle ambient conditions.

Transmission Repetition Rate: 1 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 224 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64992 (0x00FDE0)

Start Position	Length	Parameter Name	SPN
1	1 byte	Solar Intensity Percent	2610
2	1 byte	Solar Sensor Maximum	2611
3-4	2 bytes	Specific Humidity	4490

**PGN 64993 Cab A/C Climate System Information****CACI**

This message contains measurement and condition information from cab air conditioning components.

Transmission Repetition Rate: 1 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 225 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64993 (0x00FDE1)

Start Position	Length	Parameter Name	SPN
1	1 byte	Cab A/C Refrigerant Compressor Outlet Pressure	2609

**PGN 64994 Supply Pressure Demand****SPR**

Used for controlling the supply pressure. Often used to raise the pressure of a supply pressure circuit in situations where more pneumatic energy is needed.

This message is the setpoint for the PGN 65198 message.

Transmission Repetition Rate: 1 s, when active  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 226 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64994 (0x00FDE2)

Start Position	Length	Parameter Name	SPN
1	1 byte	Pneumatic Supply Pressure Request	2603
2	1 byte	Parking and/or Trailer Air Pressure Request	2604
3	1 byte	Service Brake Air Pressure Request, Circuit #1	2605
4	1 byte	Service Brake Air Pressure Request, Circuit #2	2606
5	1 byte	Auxiliary Equipment Supply Pressure Request	2607
6	1 byte	Air Suspension Supply Pressure Request	2608

**PGN 64995 Equipment Operation and Control****EOAC**

Parameters related to the operation and controls for equipment

Transmission Repetition Rate: 250 mS  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 227 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64995 (0x00FDE3)

Start Position	Length	Parameter Name	SPN
1	1 byte	Travel Velocity Control Position	2601

**PGN 64996      Equipment Performance Data****EPD**

Parameters related to the performance characteristics of equipment

Transmission Repetition Rate: 500 mS  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 228      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64996 (0x00FDE4)

Start Position	Length	Parameter Name	SPN
1	1 byte	Payload Percentage	2600

**PGN 64997      Maximum Vehicle Speed Limit Status****MVS**

Reports the possible maximum vehicle speed limits, one through seven, and the applied maximum vehicle speed limit.

Transmission Repetition Rate: 1 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 229      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 64997 (0x00FDE5)

Start Position	Length	Parameter Name	SPN
1	1 byte	Maximum Vehicle Speed Limit 1	2588
2	1 byte	Maximum Vehicle Speed Limit 2	2589
3	1 byte	Maximum Vehicle Speed Limit 3	2590
4	1 byte	Maximum Vehicle Speed Limit 4	2591
5	1 byte	Maximum Vehicle Speed Limit 5	2592
6	1 byte	Maximum Vehicle Speed Limit 6	2593
7	1 byte	Maximum Vehicle Speed Limit 7	2594
8	1 byte	Applied Vehicle Speed Limit	2595



**PGN 64998      Hydraulic Braking System****HBS**

Used for information on a hydraulic brake system

As an example: this PGN may be used for a two circuit hydraulic brake system with separate circuits for front and rear axle. The hydraulic energy is supplied via two independent electrically driven pumps. The energy is stored in gas filled hydraulic accumulators also separated for each circuit.

Transmission Repetition Rate: 100 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 253  
PDU Specific: 230      PGN Supporting Information:  
Default Priority: 3  
Parameter Group Number: 64998 (0x00FDE6)

Start Position	Length	Parameter Name	SPN
1	1 byte	Hydraulic Brake Pressure Circuit 1	2580
2	1 byte	Hydraulic Brake Pressure Circuit 2	2581
3.1	2 bits	Hydraulic Brake Pressure Warning State Circuit 1	2584
3.3	2 bits	Hydraulic Brake Pressure Warning State Circuit 2	2585
3.5	2 bits	Hydraulic Brake Pressure Supply State Circuit 1	2582
3.7	2 bits	Hydraulic Brake Pressure Supply State Circuit 2	2583
4.1	2 bits	Hydraulic Brake System Audible Warning Command	2930
4.3	2 bits	Hydraulic Brake Fluid Level Switch	2931

**PGN 65031      Exhaust Temperature****ET**

Transmission Repetition Rate: 0.5 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 7      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 65031 (0x00FE07)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Engine Exhaust Gas Temperature - Right Manifold	2433
3-4	2 bytes	Engine Exhaust Gas Temperature - Left Manifold	2434

**PGN 65088****Lighting Data****LD**

This lighting message is a response to the request for lighting data in the lighting command message. Each lighting controller on the tractor and attached implements must transmit this message to the Tractor ECU when requested. The tractor will use this information to determine which lighting systems are functioning. Lighting controllers that have lamp sensing capability will also report failed light bulbs. This is a legal requirement in many areas.

See PGN 65089 for the lighting command message.

Transmission Repetition Rate:	As requested.	
Data Length:	8	
Extended Data Page:	0	
Data Page:	0	
PDU Format:	254	
PDU Specific:	64	PGN Supporting Information:
Default Priority:	6	
Parameter Group Number:	65088 (0x00FE40)	

Start Position	Length	Parameter Name	SPN
1.1	2 bits	Running Light	2404
1.3	2 bits	Alternate Beam Head Light Data	2352
1.5	2 bits	Low Beam Head Light Data	2350
1.7	2 bits	High Beam Head Light Data	2348
2.1	2 bits	Tractor Front Fog Lights	2388
2.3	2 bits	Rotating Beacon Light	2386
2.5	2 bits	Right Turn Signal Lights	2370
2.7	2 bits	Left Turn Signal Lights	2368
3.1	2 bits	Back Up Light and Alarm Horn	2392
3.3	2 bits	Center Stop Light	2376
3.5	2 bits	Right Stop Light	2374
3.7	2 bits	Left Stop Light	2372
4.1	2 bits	Implement Clearance Light	2384
4.3	2 bits	Tractor Clearance Light	2382
4.5	2 bits	Implement Marker Light	2380
4.7	2 bits	Tractor Marker Light	2378
5.1	2 bits	Rear Fog Lights	2390
5.3	2 bits	Tractor Underside Mounted Work Lights	2358
5.5	2 bits	Tractor Rear Low Mounted Work Lights	2360
5.7	2 bits	Tractor Rear High Mounted Work Lights	2362
6.1	2 bits	Tractor Side Low Mounted Work Lights	2364
6.3	2 bits	Tractor Side High Mounted Work Lights	2366
6.5	2 bits	Tractor Front Low Mounted Work Lights	2354
6.7	2 bits	Tractor Front High Mounted Work Lights	2356
7.1	2 bits	Implement OEM Option 2 Light	2398
7.3	2 bits	Implement OEM Option 1 Light	2396
7.5	2 bits	Implement Right Facing Work Light	2407
7.7	2 bits	Implement Left Facing Work Light	2598
8.3	2 bits	Implement Right Forward Work Light	2402
8.5	2 bits	Implement Left Forward Work Light	2400
8.7	2 bits	Implement Rear Work Light	2394

**PGN 65089****Lighting Command****LC**

The lighting command message has been defined as a global message from the tractor to all lighting controllers on the tractor and attached implements. Separate messages are provided for tractor and implement work and driving lights. Additional commands have been provided for 3 optional lights on implements to meet the needs of specialty equipment. Common marking and signaling messages are provided.

This message is used to control the state of all lighting functions. The lighting command message shall be sent on each change of state of a lamp. The state values indicate the lights is to be turned ON or OFF. Flashing is accomplished by sending the lighting message with the state alternately ON or OFF. A lighting command message must be sent at least

once per second. It is the responsibility of the tractor designer to provide the correct combination of lamp commands to meet local legislative directives.

See PGN 65088 for the message to provide feedback for this command message.

Transmission Repetition Rate:	Every 1 s and on change of state but no faster than every 100 ms
Data Length:	8
Extended Data Page:	0
Data Page:	0
PDU Format:	254
PDU Specific:	65 PGN Supporting Information:
Default Priority:	3
Parameter Group Number:	65089 (0x00FE41)

Start Position	Length	Parameter Name	SPN
1.1	2 bits	Running Light Command	2403
1.3	2 bits	Alternate Beam Head Light Command	2351
1.5	2 bits	Low Beam Head Light Command	2349
1.7	2 bits	High Beam Head Light Command	2347
2.1	2 bits	Tractor Front Fog Lights Command	2387
2.3	2 bits	Rotating Beacon Light Command	2385
2.5	2 bits	Right Turn Signal Lights Command	2369
2.7	2 bits	Left Turn Signal Lights Command	2367
3.1	2 bits	Back Up Light and Alarm Horn Command	2391
3.3	2 bits	Center Stop Light Command	2375
3.5	2 bits	Right Stop Light Command	2373
3.7	2 bits	Left Stop Light Command	2371
4.1	2 bits	Implement Clearance Light Command	2383
4.3	2 bits	Tractor Clearance Light Command	2381
4.5	2 bits	Implement Marker Light Command	2379
4.7	2 bits	Tractor Marker Light Command	2377
5.1	2 bits	Rear Fog Light Command	2389
5.3	2 bits	Tractor Underside Mounted Work Lights Command	2357
5.5	2 bits	Tractor Rear Low Mounted Work Lights Command	2359
5.7	2 bits	Tractor Rear High Mounted Work Lights Command	2361
6.1	2 bits	Tractor Side Low Mounted Work Lights Command	2363
6.3	2 bits	Tractor Side High Mounted Work Lights Command	2365
6.5	2 bits	Tractor Front Low Mounted Work Lights Command	2353
6.7	2 bits	Tractor Front High Mounted Work Lights Command	2355
7.1	2 bits	Implement OEM Option 2 Light Command	2397
7.3	2 bits	Implement OEM Option 1 Light Command	2395
7.5	2 bits	Implement Right Facing Work Light Command	2406
7.7	2 bits	Implement Left Facing Work Light Command	2597
8.1	2 bits	Lighting Data Request Command	2393
8.3	2 bits	Implement Right Forward Work Light Command	2401
8.5	2 bits	Implement Left Forward Work Light Command	2399
8.7	2 bits	Implement Rear Work Light Command	2405

**(R) PGN 65098      Electronic Transmission Controller 7****ETC7**

Transmission status information from the transmission controller to network.

Transmission Repetition Rate: 100 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 74      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 65098 (0x00FE4A)

Start Position	Length	Parameter Name	SPN
1.1	2 bits	Transmission Current Range Display Blank State	4176
1.3	2 bits	Transmission Service Indicator	4178
1.5	2 bits	Transmission Requested Range Display Blank State	1850
1.7	2 bits	Transmission Requested Range Display Flash State	1849
2.1	2 bits	Transmission Ready for Brake Release	3086
2.3	2 bits	Active Shift Console Indicator	2945
2.5	2 bits	Transmission Engine Crank Enable	2900
2.7	2 bits	Transmission Shift Inhibit Indicator	1851
3.1	2 bits	Transmission Mode 4 Indicator	2539
3.3	2 bits	Transmission Mode 3 Indicator	2538
3.5	2 bits	Transmission Mode 2 Indicator	2537
3.7	2 bits	Transmission Mode 1 Indicator	2536
4	1 byte	Transmission Requested Gear Feedback	3289
5.1	2 bits	Transmission Mode 5 Indicator	4250
5.3	2 bits	Transmission Mode 6 Indicator	4251
5.5	2 bits	Transmission Mode 7 Indicator	4252
5.7	2 bits	Transmission Mode 8 Indicator	4253
6.1	2 bits	Transmission Reverse Gear Shift Inhibit Status	4261
6.3	2 bits	Transmission Warning Indicator	5344

**PGN 65099      Transmission Configuration 2****TCFG2**

Contains transmission configuration information.

Transmission Repetition Rate: On request or sender may transmit every 5 seconds until acknowledged by reception of the engine configuration message PGN 65251 SPN 1846.  
 Data Length: Variable  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 75      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 65099 (0x00FE4B)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Transmission Torque Limit	1845

**PGN 65100 Military Lighting Command****ML**

The message contains parameters that control military specific lights.

Transmission Repetition Rate: 500ms or upon state change, but not faster than 100 ms.  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 76 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 65100 (0x00FE4C)

Start Position	Length	Parameter Name	SPN
1.1	2 bits	Rear Black Out Marker Select	1840
1.3	2 bits	Front Black Out Marker Lamp Select	1839
1.5	2 bits	Convoy Lamp Select	1838
1.7	2 bits	Convoy Driving Lamp Select	1837
3.7	2 bits	Black Out Brake/Stop Lamp Select	1841
4.1	2 bits	Night Vision Illuminator Select	1843
4.7	2 bits	Black Out Work Lamp Select	1842
8	1 byte	Operators Black Out Intensity Selection	1844

**PGN 65101 Total Averaged Information****TAVG**

Averages of information accumulated over the life of the engine

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 77 PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 65101 (0x00FE4D)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Engine Total Average Fuel Rate	1834
3-4	2 bytes	Engine Total Average Fuel Economy	1835

**PGN 65102 Door Control 1****DC1**

Used for door information.

Transmission Repetition Rate: 100 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 78 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 65102 (0x00FE4E)

Start Position	Length	Parameter Name	SPN
1.1	4 bits	Position of doors	1821
1.5	2 bits	Ramp / Wheel Chair Lift Position	1820
1.7	2 bits	Status 2 of doors	3411

**PGN 65103      Vehicle Dynamic Stability Control 1****VDC1**

Contains information which relates to the VDC system status.

Transmission Repetition Rate: 100ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 79      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 65103 (0x00FE4F)

Start Position	Length	Parameter Name	SPN
1.1	2 bits	VDC Information Signal	1813
1.3	2 bits	VDC Fully Operational	1814
1.5	2 bits	VDC brake light request	1815
2.1	2 bits	ROP Engine Control active	1816
2.3	2 bits	ROP Brake Control active	1818
2.5	2 bits	YC Engine Control active	1817
2.7	2 bits	YC Brake Control active	1819

**PGN 65104      Battery Temperature****BT1**

Contains battery temperature information.

Transmission Repetition Rate: 1 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 80      PGN Supporting Information: See Appendix D - PGN 65104  
Default Priority: 6  
Parameter Group Number: 65104 (0x00FE50)

Start Position	Length	Parameter Name	SPN
1	1 byte	Battery 1 Temperature	1800
2	1 byte	Battery 2 Temperature	1801

**PGN 65105      Adaptive Cruise Control, Operator Input****ACC2**

The operator requested characteristics for the ACC systems operation.

Transmission Repetition Rate: 250 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 81      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 65105 (0x00FE51)

Start Position	Length	Parameter Name	SPN
1.1	2 bits	ACC usage demand	5023
1.6	3 bits	Requested ACC Distance Mode	1799

**PGN 65106      Vehicle Electrical Power #3****VEP3**

This contains high resolution/range parameters reported from the alternator or power generation components.

Transmission Repetition Rate: 1 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 82      PGN Supporting Information: See Appendix D - PGN 65104  
Default Priority: 6  
Parameter Group Number: 65106 (0x00FE52)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Alternator Current (High Range/Resolution)	1795
3-4	2 bytes	Net Battery Current (High Range/Resolution)	2579

**PGN 65107      Retarder Continuous Torque & Speed Limit****RTC1**

Transmission Repetition Rate: 5 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 83      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 65107 (0x00FE53)

Start Position	Length	Parameter Name	SPN
1	1 byte	Low Limit Threshold for Maximum RPM from Retarder	1776
2	1 byte	High Limit Threshold for Minimum Continuous RPM from Retarder	1777
3	1 byte	Low Limit Threshold for Maximum Torque from Retarder	1778
4	1 byte	High Limit Threshold for Minimum Continuous Torque from Retarder	1779
5	1 byte	Maximum Continuous Retarder Speed	1780
6	1 byte	Minimum Continuous Retarder Speed	1781
7	1 byte	Maximum Continuous Retarder Torque	1782
8	1 byte	Minimum Continuous Retarder Torque	1783

**PGN 65108      Engine Continuous Torque & Speed Limit****ECT1**

Transmission Repetition Rate: 5 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 84      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 65108 (0x00FE54)

Start Position	Length	Parameter Name	SPN
1	1 byte	Engine Low Limit Threshold for Maximum RPM from Engine	1768
2	1 byte	Engine High Limit Threshold for Minimum Continuous Engine RPM	1769
3	1 byte	Engine Low Limit Threshold for Maximum Torque from Engine	1770
4	1 byte	Engine High Limit Threshold for Minimum Continuous Torque from Engine	1771
5	1 byte	Engine Maximum Continuous RPM	1772
6	1 byte	Engine Minimum Continuous RPM	1773
7	1 byte	Engine Maximum Continuous Torque	1774
8	1 byte	Engine Minimum Continuous Torque	1775

**PGN 65109      Gaseous Fuel Properties****GFD**

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 85      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 65109 (0x00FE55)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Specific Heat Ratio	1767



**(R) PGN 65110      Aftertreatment 1 SCR Reagent Tank 1 Information****AT1T1I**

Contains information on various tank levels

Transmission Repetition Rate: 1 s  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 86      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 65110 (0x00FE56)

Start Position	Length	Parameter Name	SPN
1	1 byte	Aftertreatment 1 SCR Catalyst Tank Level	1761
2	1 byte	Aftertreatment 1 SCR Catalyst Tank Temperature	3031
3-4	2 bytes	Aftertreatment 1 SCR Catalyst Tank Level 2	3517
5.1	5 bits	Aftertreatment 1 SCR Catalyst Tank Level Preliminary FMI	3532
5.6	3 bits	Aftertreatment 1 DEF Tank Low Level Indicator	5245
6.1	5 bits	Aftertreatment 1 SCR Catalyst Reagent Tank 1 Temperature Preliminary FMI	4365
6.6	3 bits	Aftertreatment SCR Operator Inducement Severity	5246
7	1 byte	Aftertreatment 1 SCR Catalyst Tank Heater	3363
8.1	5 bits	Aftertreatment 1 SCR Catalyst Reagent Tank 1 Heater Preliminary FMI	4366

**PGN 65111      Air Suspension Control 5****ASC5**

Used for damper stiffness information

Transmission Repetition Rate: 100 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 87      PGN Supporting Information:  
 Default Priority: 3  
 Parameter Group Number: 65111 (0x00FE57)

Start Position	Length	Parameter Name	SPN
1	1 byte	Damper Stiffness Front Axle	1729
2	1 byte	Damper Stiffness Rear Axle	1730
3	1 byte	Damper Stiffness Lift / Tag Axle	1731
4.1	2 bits	Electronic Shock Absorber Control Mode - Front Axle	1833
4.3	2 bits	Electronic Shock Absorber Control Mode - Rear Axle	1832
4.5	2 bits	Electronic Shock Absorber Control Mode - Lift/Tag Axle	1831

**PGN 65112      Air Suspension Control 4****ASC4**

Used for bellow pressure information

Transmission Repetition Rate: 100 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 88      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 65112 (0x00FE58)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Bellow Pressure Front Axle Left	1725
3-4	2 bytes	Bellow Pressure Front Axle Right	1726
5-6	2 bytes	Bellow Pressure Rear Axle Left	1727
7-8	2 bytes	Bellow Pressure Rear Axle Right	1728

**PGN 65113      Air Suspension Control 3****ASC3**

Used for height information

Transmission Repetition Rate: 100 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 89      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 65113 (0x00FE59)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Relative Level Front Axle Left	1721
3-4	2 bytes	Relative Level Front Axle Right	1722
5-6	2 bytes	Relative Level Rear Axle Left	1724
7-8	2 bytes	Relative Level Rear Axle Right	1723

**(R) PGN 65114      Air Suspension Control 1****ASC1**

Used for suspension control information

Transmission Repetition Rate: 100 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 90      PGN Supporting Information:  
 Default Priority: 3  
 Parameter Group Number: 65114 (0x00FE5A)

Start Position	Length	Parameter Name	SPN
1.1	4 bits	Nominal Level Front Axle	1734
1.5	4 bits	Nominal Level Rear Axle	1733
2.1	2 bits	Below Nominal Level Front Axle	1738
2.3	2 bits	Below Nominal Level Rear Axle	1754
2.5	2 bits	Above Nominal Level Front Axle	1737
2.7	2 bits	Above Nominal Level Rear Axle	1736
3.1	2 bits	Lowering Control Mode Front Axle	1740
3.3	2 bits	Lowering Control Mode Rear Axle	1755
3.5	2 bits	Lifting Control Mode Front Axle	1739
3.7	2 bits	Lifting Control Mode Rear Axle	1756
4.1	4 bits	Kneeling Information	1742
4.5	4 bits	Level Control Mode	1741
5.1	2 bits	Security Device	1746
5.3	2 bits	Vehicle Motion Inhibit	1745
5.5	2 bits	Door Release	1744
5.7	2 bits	Lift Axle 1 Position	1743
6.1	2 bits	Front Axle in Bumper Range	1824
6.3	2 bits	Rear Axle in Bumper Range	1823
6.7	2 bits	Lift Axle 2 Position	1822
7.1	2 bits	Suspension Remote Control 1	1826
7.3	2 bits	Suspension Remote control 2	1825
7.5	2 bits	Allow Level Control During Braking Status	5294
7.7	2 bits	Speed Dependant Level Control Status	5296
8.1	4 bits	Suspension Control Refusal Information	1827
8.5	4 bits	Memory level	5432

**PGN 65115      Forward Lane Image****FLI2**

Transmission Repetition Rate: 100 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 91      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 65115 (0x00FE5B)

Start Position	Length	Parameter Name	SPN
1.3	2 bits	Lane Tracking Status Right Side	1711
1.5	2 bits	Lane Tracking Status Left Side	1710
1.7	2 bits	Lane Departure Indication Enable Status	1702

**PGN 65126      Battery Main Switch Information****BM**

Transmission Repetition Rate: 1 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 102      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 65126 (0x00FE66)

Start Position	Length	Parameter Name	SPN
1.1	2 bits	Battery Main Switch Hold State	1681

**PGN 65127      Climate Control Configuration****CCC**

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 103      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 65127 (0x00FE67)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Auxiliary Heater Maximum Output Power	1690

**PGN 65128      Vehicle Fluids****VF**

Transmission Repetition Rate: 1 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 104      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 65128 (0x00FE68)

Start Position	Length	Parameter Name	SPN
1	1 byte	Hydraulic Temperature	1638
2.1	2 bits	Hydraulic Oil Filter Restriction Switch	1713
2.3	2 bits	Winch Oil Pressure Switch	1857
3	1 byte	Hydraulic Oil Level	2602

**PGN 65129      Engine Temperature 3****ET3**

This parameter group is used to transmit high resolution engine temperatures for control purposes.

Transmission Repetition Rate: 1 s  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 105      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 65129 (0x00FE69)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Engine Intake Manifold 1 Air Temperature (High Resolution)	1636
3-4	2 bytes	Engine Coolant Temperature (High Resolution)	1637
5-6	2 bytes	Engine Intake Valve Actuation System Oil Temperature	2986
7-8	2 bytes	Engine Charge Air Cooler 1 Outlet Temperature	2630

**PGN 65130      Engine Fuel/lube systems****EFS**

Transmission Repetition Rate: 0.5 s  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 106      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 65130 (0x00FE6A)

Start Position	Length	Parameter Name	SPN
1	1 byte	Engine Oil Level Remote Reservoir	1380
2	1 byte	Engine Fuel Supply Pump Intake Pressure	1381
3	1 byte	Engine Fuel Filter (suction side) Differential Pressure	1382
4	1 byte	Engine Waste Oil Reservoir Level	3548
5	1 byte	Engine Oil-Filter Outlet Pressure	3549
6.1	2 bits	Engine Oil Priming Pump Switch	3550
6.3	2 bits	Engine Oil Priming State	3551
6.5	2 bits	Engine Oil Pre-Heated State	3552
6.7	2 bits	Engine Coolant Pre-heated State	3553
7.1	3 bits	Engine Ventilation Status	3554
7.4	2 bits	Fuel Pump Primer Status	4083

**(R) PGN 65131      Driver's Identification****DI**

Field:

a Driver 1 Identification

Delimiter (ASCII "\*\*")

b Driver 2 Identification

Delimiter (ASCII "\*\*")

NOTE - If only driver card 1 is present, only the parameter driver 1 identification and two delimiters shall be transmitted. If only driver card 2 is present, a delimiter followed by parameter driver 2 identification and the second delimiter shall be transmitted. If no driver cards are present, only the two delimiters shall be sent.

Transmission Repetition Rate: On request  
 Data Length: Variable  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 107      PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 65131 (0x00FE6B)

Start Position	Length	Parameter Name	SPN
a	Variable - up to 1728 bytes followed by an "**" delimiter	Driver 1 identification	1625
b	Variable - up to 1728 bytes followed by an "**" delimiter	Driver 2 identification	1626

**PGN 65132      Tachograph****TCO1**

Transmission Repetition Rate: 50 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 108      PGN Supporting Information:  
 Default Priority: 3  
 Parameter Group Number: 65132 (0x00FE6C)

Start Position	Length	Parameter Name	SPN
1.1	3 bits	Driver 1 working state	1612
1.4	3 bits	Driver 2 working state	1613
1.7	2 bits	Vehicle motion	1611
2.1	4 bits	Driver 1 Time Related States	1617
2.5	2 bits	Driver card, driver 1	1615
2.7	2 bits	Vehicle Overspeed	1614
3.1	4 bits	Driver 2 Time Related States	1618
3.5	2 bits	Driver card, driver 2	1616
4.1	2 bits	System event	1622
4.3	2 bits	Handling information	1621
4.5	2 bits	Tachograph performance	1620
4.7	2 bits	Direction indicator	1619
5-6	2 bytes	Tachograph output shaft speed	1623
7-8	2 bytes	Tachograph vehicle speed	1624

**PGN 65133 Heater Information****HTR**

Transmission Repetition Rate: 1 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 109 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 65133 (0x00FE6D)

Start Position	Length	Parameter Name	SPN
1	1 byte	Auxiliary Heater Output Coolant Temperature	1687
2	1 byte	Auxiliary Heater Input Air Temperature	1688
3	1 byte	Auxiliary Heater Output Power Percent	1689
4.1	4 bits	Auxiliary Heater Mode	1677
5.1	2 bits	Auxiliary Heater Water Pump Status	1676
5.3	2 bits	Cab Ventilation	1678
5.5	2 bits	Engine Heating Zone	1679
5.7	2 bits	Cab Heating Zone	1680

**PGN 65134 High Resolution Wheel Speed****HRW**

Transmission Repetition Rate: 20 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 110 PGN Supporting Information:  
Default Priority: 2  
Parameter Group Number: 65134 (0x00FE6E)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Front Axle, Left Wheel Speed	1592
3-4	2 bytes	Front axle, right wheel speed	1593
5-6	2 bytes	Rear axle, left wheel speed	1594
7-8	2 bytes	Rear axle, right wheel speed	1595

**PGN 65135 Adaptive Cruise Control****ACC1**

NOTE—The ACC1 message is required whenever the engine is running and ACC is powered on and not faulted. The timeout for ACC1 message will be between 2.5 times to 5 times the update rate.

The ACC1 message is intended primarily for engines and driver display units. The receiving device should identify the ACC device based on ACC function value of 32 (headway controller) or source address of 42 (headway controller).

In the event that the engine is running, the ACC is installed and the ACC1 message is not present, the engine will disable cruise control and return to non-cruise mode; also, the driver display unit will notify the driver that ACC operation is no longer available. In addition to the ACC1 timeout, engine cruise control will also be disabled if parameter "Adaptive Cruise Control State" in ACC1 is 110b (ACC disabled or in error). In some cases, it may be possible for the driver to restart cruise control (without ACC capability) during ACC/J1939 fault by performing a reset function. See Figure PGN65135\_A.

It is possible that engines and driver display units may require calibration settings in order to know if the present vehicle configuration includes an ACC system or not. A calibration setting may also be needed for defining the driver reset function.

Transmission Repetition Rate:	100ms or upon state change, but not faster than 20 ms.		
Data Length:	8		
Extended Data Page:	0		
Data Page:	0		
PDU Format:	254		
PDU Specific:	111	PGN Supporting Information: See Appendix D - PGN 65135	
Default Priority:	4		
Parameter Group Number:	65135 (0x00FE6F)		

Start Position	Length	Parameter Name	SPN
1	1 byte	Speed of forward vehicle	1586
2	1 byte	Distance to forward vehicle	1587
3	1 byte	Adaptive Cruise Control Set Speed	1588
4.1	3 bits	Adaptive Cruise Control Mode	1590
4.4	3 bits	Adaptive cruise control set distance mode	1589
5-6	2 bytes	Road curvature	1591
7.1	2 bits	ACC Target Detected	1798
7.3	2 bits	ACC System Shutoff Warning	1797
7.5	2 bits	ACC Distance Alert Signal	1796
7.7	2 bits	Forward Collision Warning	5022

**PGN 65136 Combination Vehicle Weight****CVW**

Transmission Repetition Rate:	On request		
Data Length:	Variable		
Extended Data Page:	0		
Data Page:	0		
PDU Format:	254		
PDU Specific:	112	PGN Supporting Information:	
Default Priority:	6		
Parameter Group Number:	65136 (0x00FE70)		

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Powered Vehicle Weight	1585
3-4	2 bytes	Gross Combination Vehicle Weight	1760



**PGN 65137      Laser Tracer Position****LTP**

Transmission Repetition Rate: 50 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 113      PGN Supporting Information:  
Default Priority: 3  
Parameter Group Number: 65137 (0x00FE71)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Laser Tracer Target Deviation	1579
3-4	2 bytes	Laser Tracer Vertical Distance	1580
5	1 byte	Laser Tracer Horizontal Deviation	1581
6	8 bits	LED Display Data #2	1582
7	8 bits	Laser Tracer Information	1583

**(R) PGN 65138      Laser Leveling System Blade Control****LBC**

Transmission Repetition Rate: 50 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 114      PGN Supporting Information:  
Default Priority: 3  
Parameter Group Number: 65138 (0x00FE72)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Blade Duration and Direction	1577
3	8 bits	Blade Control Mode	1578
4.1	4 bits	Blade Control Mode - Left	5407
4.5	4 bits	Blade Control Mode - Right	5408
5.1	2 bits	Land Leveling System Enable Status	5409

**PGN 65139      Laser Receiver Mast Position****LMP**

Transmission Repetition Rate: 50 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 115      PGN Supporting Information:  
Default Priority: 3  
Parameter Group Number: 65139 (0x00FE73)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Mast Position	1576

**PGN 65140      Modify Leveling System Control Set Point****LSP**

Transmission Repetition Rate: 50 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 116      PGN Supporting Information:  
 Default Priority: 3  
 Parameter Group Number: 65140 (0x00FE74)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Modify Leveling System Set Point	1575
3-6	4 bytes	Blade Height Set Point - High Resolution	1759

**PGN 65141      Laser Leveling System Vertical Deviation****LVD**

Transmission Repetition Rate: 50 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 117      PGN Supporting Information:  
 Default Priority: 3  
 Parameter Group Number: 65141 (0x00FE75)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Laser Strike Vertical Deviation	1574
3	1 byte	Laser Receiver Type	2576
4-5	2 bytes	Laser Strike Data Latency	2793
6-7	2 bytes	Absolute Laser Strike Position	2794

**PGN 65142      Laser Leveling System Vertical Position Display Data****LVDD**

Transmission Repetition Rate: 100 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 118      PGN Supporting Information:  
 Default Priority: 4  
 Parameter Group Number: 65142 (0x00FE76)

Start Position	Length	Parameter Name	SPN
1	8 bits	LED Display Data #1	1573
2.1	4 bits	LED Display Mode Control	1805
2.5	4 bits	LED Display Deadband Control	1806
3.1	4 bits	LED Pattern Control	2578
3.5	4 bits	Display Deadbands	2577

**PGN 65143****Auxiliary Pressures****AP**

Transmission Repetition Rate: On request  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 119 PGN Supporting Information:  
 Default Priority: 7  
 Parameter Group Number: 65143 (0x00FE77)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Auxiliary Vacuum Pressure Reading	136
3-4	2 bytes	Auxiliary Gage Pressure Reading 1	137
5-6	2 bytes	Auxiliary Absolute Pressure Reading	138

**PGN 65144****Tire Pressure Control Unit Mode and Status****TP1**

Transmission Repetition Rate: On request  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 120 PGN Supporting Information:  
 Default Priority: 7  
 Parameter Group Number: 65144 (0x00FE78)

Start Position	Length	Parameter Name	SPN
1	1 byte	Tire Pressure Check Interval	39
2.1	4 bits	Steer Channel Mode	1466
3.1	4 bits	Trailer/tag Channel Mode	1467
3.5	4 bits	Drive Channel Mode	1468
4.1	2 bits	PCU Drive Solenoid Status	1469
4.3	2 bits	PCU Steer Solenoid Status	1470
4.5	2 bits	Tire Pressure Supply Switch Status	1471
5.1	2 bits	PCU Deflate Solenoid Status	1472
5.3	2 bits	PCU Control Solenoid Status	1473
5.5	2 bits	PCU Supply Solenoid Status	1474
5.7	2 bits	PCU Trailer, Tag or Push Solenoid Status	1475

**PGN 65145****Tire Pressure Control Unit Target Pressures****TP2**

Transmission Repetition Rate: On request  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 121 PGN Supporting Information:  
 Default Priority: 7  
 Parameter Group Number: 65145 (0x00FE79)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Trailer, Tag Or Push Channel Tire Pressure Target	141
3-4	2 bytes	Drive Channel Tire Pressure Target	142
5-6	2 bytes	Steer Channel Tire Pressure Target	143

**PGN 65146 Tire Pressure Control Unit Current Pressures****TP3**

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 122 PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 65146 (0x00FE7A)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Trailer, Tag Or Push Channel Tire Pressure	144
3-4	2 bytes	Drive Channel Tire Pressure	145
5-6	2 bytes	Steer Channel Tire Pressure	146

**PGN 65147 Combustion Time 1****CT1**

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 123 PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 65147 (0x00FE7B)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Engine Cylinder #1 Combustion Time	1444
3-4	2 bytes	Engine Cylinder #2 Combustion Time	1445
5-6	2 bytes	Engine Cylinder #3 Combustion Time	1446
7-8	2 bytes	Engine Cylinder #4 Combustion Time	1447

**PGN 65148 Combustion Time 2****CT2**

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 124 PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 65148 (0x00FE7C)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Engine Cylinder #5 Combustion Time	1448
3-4	2 bytes	Engine Cylinder #6 Combustion Time	1449
5-6	2 bytes	Engine Cylinder #7 Combustion Time	1450
7-8	2 bytes	Engine Cylinder #8 Combustion Time	1451

**PGN 65149****Combustion Time 3****CT3**

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 125 PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 65149 (0x00FE7D)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Engine Cylinder #9 Combustion Time	1452
3-4	2 bytes	Engine Cylinder #10 Combustion Time	1453
5-6	2 bytes	Engine Cylinder #11 Combustion Time	1454
7-8	2 bytes	Engine Cylinder #12 Combustion Time	1455

**PGN 65150****Combustion Time 4****CT4**

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 126 PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 65150 (0x00FE7E)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Engine Cylinder #13 Combustion Time	1456
3-4	2 bytes	Engine Cylinder #14 Combustion Time	1457
5-6	2 bytes	Engine Cylinder #15 Combustion Time	1458
7-8	2 bytes	Engine Cylinder #16 Combustion Time	1459

**PGN 65151****Combustion Time 5****CT5**

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 127 PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 65151 (0x00FE7F)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Engine Cylinder #17 Combustion Time	1460
3-4	2 bytes	Engine Cylinder #18 Combustion Time	1461
5-6	2 bytes	Engine Cylinder #19 Combustion Time	1462
7-8	2 bytes	Engine Cylinder #20 Combustion Time	1463

**PGN 65152****Combustion Time 6****CT6**

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 128 PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 65152 (0x00FE80)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Engine Desired Combustion Time	1464
3-4	2 bytes	Engine Average Combustion Time	1465

**PGN 65153****Fuel Information 2 (Gaseous)****GFI2**

Gaseous fuel information 2

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 129 PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 65153 (0x00FE81)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Engine Fuel Flow Rate 1	1440
3-4	2 bytes	Engine Fuel Flow Rate 2	1441
5	1 byte	Engine Fuel Valve 1 Position	1442
6	1 byte	Engine Fuel Valve 2 Position	1443
7	1 byte	Engine Requested Fuel Valve 1 Position	1765
8	1 byte	Engine Requested Fuel Valve 2 Position	1766

**PGN 65154****Ignition Timing 1****IT1**

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 130 PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 65154 (0x00FE82)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Engine Cylinder #1 Ignition Timing	1413
3-4	2 bytes	Engine Cylinder #2 Ignition Timing	1414
5-6	2 bytes	Engine Cylinder #3 Ignition Timing	1415
7-8	2 bytes	Engine Cylinder #4 Ignition Timing	1416

**PGN 65155 Ignition Timing 2****IT2**

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 131 PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 65155 (0x00FE83)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Engine Cylinder #5 Ignition Timing	1417
3-4	2 bytes	Engine Cylinder #6 Ignition Timing	1418
5-6	2 bytes	Engine Cylinder #7 Ignition Timing	1419
7-8	2 bytes	Engine Cylinder #8 Ignition Timing	1420

**PGN 65156 Ignition Timing 3****IT3**

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 132 PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 65156 (0x00FE84)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Engine Cylinder #9 Ignition Timing	1421
3-4	2 bytes	Engine Cylinder #10 Ignition Timing	1422
5-6	2 bytes	Engine Cylinder #11 Ignition Timing	1423
7-8	2 bytes	Engine Cylinder #12 Ignition Timing	1424

**PGN 65157 Ignition Timing 4****IT4**

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 133 PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 65157 (0x00FE85)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Engine Cylinder #13 Ignition Timing	1425
3-4	2 bytes	Engine Cylinder #14 Ignition Timing	1426
5-6	2 bytes	Engine Cylinder #15 Ignition Timing	1427
7-8	2 bytes	Engine Cylinder #16 Ignition Timing	1428

**PGN 65158 Ignition Timing 5****IT5**

Transmission Repetition Rate: On request  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 134 PGN Supporting Information:  
 Default Priority: 7  
 Parameter Group Number: 65158 (0x00FE86)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Engine Cylinder #17 Ignition Timing	1429
3-4	2 bytes	Engine Cylinder #18 Ignition Timing	1430
5-6	2 bytes	Engine Cylinder #19 Ignition Timing	1431
7-8	2 bytes	Engine Cylinder #20 Ignition Timing	1432

**PGN 65159 Ignition Timing 6****IT6**

Transmission Repetition Rate: On request  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 135 PGN Supporting Information:  
 Default Priority: 7  
 Parameter Group Number: 65159 (0x00FE87)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Engine Desired Ignition Timing #1	1433
3-4	2 bytes	Engine Desired Ignition Timing #2	1434
5-6	2 bytes	Engine Desired Ignition Timing #3	1435
7-8	2 bytes	Engine Actual Ignition Timing	1436

**PGN 65160 Ignition Transformer Secondary Output 1****ISO1**

Transmission Repetition Rate: On request  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 136 PGN Supporting Information:  
 Default Priority: 7  
 Parameter Group Number: 65160 (0x00FE88)

Start Position	Length	Parameter Name	SPN
1	1 byte	Engine Cylinder #1 Ignition Transformer Secondary Output	1393
2	1 byte	Engine Cylinder #2 Ignition Transformer Secondary Output	1394
3	1 byte	Engine Cylinder #3 Ignition Transformer Secondary Output	1395
4	1 byte	Engine Cylinder #4 Ignition Transformer Secondary Output	1396
5	1 byte	Engine Cylinder #5 Ignition Transformer Secondary Output	1397
6	1 byte	Engine Cylinder #6 Ignition Transformer Secondary Output	1398
7	1 byte	Engine Cylinder #7 Ignition Transformer Secondary Output	1399
8	1 byte	Engine Cylinder #8 Ignition Transformer Secondary Output	1400



**PGN 65161      Ignition Transformer Secondary Output 2****ISO2**

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 137      PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 65161 (0x00FE89)

Start Position	Length	Parameter Name	SPN
1	1 byte	Engine Cylinder #9 Ignition Transformer Secondary Output	1401
2	1 byte	Engine Cylinder #10 Ignition Transformer Secondary Output	1402
3	1 byte	Engine Cylinder #11 Ignition Transformer Secondary Output	1403
4	1 byte	Engine Cylinder #12 Ignition Transformer Secondary Output	1404
5	1 byte	Engine Cylinder #13 Ignition Transformer Secondary Output	1405
6	1 byte	Engine Cylinder #14 Ignition Transformer Secondary Output	1406
7	1 byte	Engine Cylinder #15 Ignition Transformer Secondary Output	1407
8	1 byte	Engine Cylinder #16 Ignition Transformer Secondary Output	1408

**PGN 65162      Ignition Transformer Secondary Output 3****ISO3**

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 138      PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 65162 (0x00FE8A)

Start Position	Length	Parameter Name	SPN
1	1 byte	Engine Cylinder #17 Ignition Transformer Secondary Output	1409
2	1 byte	Engine Cylinder #18 Ignition Transformer Secondary Output	1410
3	1 byte	Engine Cylinder #19 Ignition Transformer Secondary Output	1411
4	1 byte	Engine Cylinder #20 Ignition Transformer Secondary Output	1412

**PGN 65163****Gaseous Fuel Pressure****GFP**

Transmission Repetition Rate: On request  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 139 PGN Supporting Information: See Appendix D - PGN 65163  
 Default Priority: 7  
 Parameter Group Number: 65163 (0x00FE8B)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Engine Fuel Valve 1 Intake Absolute Pressure	1390
3-4	2 bytes	Engine Fuel Valve Differential Pressure	1391
5-6	2 bytes	Engine Air to Fuel Differential Pressure	1392
7-8	2 bytes	Engine Fuel Valve 1 Outlet Absolute Pressure	2980

**PGN 65164****Auxiliary Analog Information****AAI**

## Auxiliary Analog Information

Transmission Repetition Rate: On request  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 140 PGN Supporting Information:  
 Default Priority: 7  
 Parameter Group Number: 65164 (0x00FE8C)

Start Position	Length	Parameter Name	SPN
1	1 byte	Auxiliary Temperature 1	441
2	1 byte	Auxiliary Temperature 2	442
3	1 byte	Auxiliary Pressure #1	1387
4	1 byte	Auxiliary Pressure #2	1388
5-6	2 bytes	Auxiliary Level	3087
7	1 byte	Relative Humidity	354

**PGN 65165****Vehicle Electrical Power #2****VEP2**

Voltage data for the main vehicle Power Distribution system.

Transmission Repetition Rate: On request  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 141 PGN Supporting Information: See Appendix D - PGN 65104  
 Default Priority: 6  
 Parameter Group Number: 65165 (0x00FE8D)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Battery Potential / Power Input 2	444
3-4	2 bytes	ECU Power Output Supply Voltage #1	3597
5-6	2 bytes	ECU Power Output Supply Voltage #2	3598
7-8	2 bytes	ECU Power Output Supply Voltage #3	3599

**PGN 65166****Service 2****S2**

NOTE - There are two acceptable formats for the Service PGN. Format 1 has only 8 bytes of data and reports the component most in need of service for each of the three categories. Format 2, however, uses the transport protocol as necessary (See J1939-21) in order to repeat these 8 bytes of service component information until all supported service components in each category have been transmitted.

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 142 PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 65166 (0x00FE8E)

Start Position	Length	Parameter Name	SPN
1	1 byte	Service Component Identification	1379
2-3	2 bytes	Time Since Last Service	1350

**PGN 65167****Supply Pressure 2****SP2**

Transmission Repetition Rate: 1 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 143 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 65167 (0x00FE8F)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Engine External Shutdown Air Supply Pressure	1320

**PGN 65168 Engine Torque History****ETH**

NOTE - The torque history PGN is variable in length and may contain up to 125 torque history records. Each torque history record MUST BE 38 bytes in length. Any unused bytes must be 0xFF.

The last six bytes of each record are not currently defined and shall be transmitted as "not available" (0xff). In the first record, these are byte positions 34-39.

Transmission Repetition Rate: On request  
 Data Length: Variable  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 144 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 65168 (0x00FE90)

Start Position	Length	Parameter Name	SPN
01	1 byte	Number of Engine Torque History Records	1246
02-03	2 bytes	Engine Power	1247
04-05	2 bytes	Engine Peak Torque 1	1248
06-07	2 bytes	Engine Peak Torque 2	1249
08	1 byte	Calibration Record Start Month	1250
09	1 byte	Calibration Record Start Day	1251
10	1 byte	Calibration Record Start Year	1252
11-14	4 bytes	Calibration Record Duration Time	1253
15.1	2 bits	Torque Limiting Feature Status	1254
15.3	3 bits	Engine Torque Limit Feature	1632
16-17	2 bytes	Transmission Gear Ratio 1	1255
18-19	2 bytes	Engine Torque Limit 1, Transmission	1256
20-21	2 bytes	Transmission Gear Ratio 2	1257
22-23	2 bytes	Engine Torque Limit 2, Transmission	1258
24-25	2 bytes	Transmission Gear Ratio 3	1259
26-27	2 bytes	Engine Torque Limit 3, Transmission	1260
28-29	2 bytes	Engine Torque Limit 4, Transmission	1261
30-31	2 bytes	Engine Torque Limit 5, Switch	1262
32-33	2 bytes	Engine Torque Limit 6, Axle Input	1263

**PGN 65169 Fuel Leakage****FL**

Transmission Repetition Rate: 1 s  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 145 PGN Supporting Information:  
 Default Priority: 7  
 Parameter Group Number: 65169 (0x00FE91)

Start Position	Length	Parameter Name	SPN
1.1	2 bits	Engine Fuel Leakage 1	1239
1.3	2 bits	Engine Fuel Leakage 2	1240

**PGN 65170****Engine Information****EI**

Transmission Repetition Rate: 100 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 146 PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 65170 (0x00FE92)

Start Position	Length	Parameter Name	SPN
1	1 byte	Engine Pre-filter Oil Pressure	1208
2-3	2 bytes	Engine Exhaust Gas Pressure	1209
4	1 byte	Engine Fuel Rack Position	1210
5-6	2 bytes	Engine Gas Mass Flow Rate 1	1241
7-8	2 bytes	Instantaneous Estimated Brake Power	1242

**PGN 65171****Engine Electrical System/Module Information****EES**

Transmission Repetition Rate: 100 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 147 PGN Supporting Information: See Appendix D - PGN 65104  
Default Priority: 7  
Parameter Group Number: 65171 (0x00FE93)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Electrical Load	1204
3.1	2 bits	Safety Wire Status	1205

**PGN 65172****Engine Auxiliary Coolant****EAC**

Transmission Repetition Rate: 0.5 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 148 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 65172 (0x00FE94)

Start Position	Length	Parameter Name	SPN
1	1 byte	Engine Auxiliary Coolant Pressure	1203
2	1 byte	Engine Auxiliary Coolant Temperature	1212
3	1 byte	Sea Water Pump Outlet Pressure	2435

**PGN 65173****Rebuild Information****RBI**

Transmission Repetition Rate: On request  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 149 PGN Supporting Information:  
 Default Priority: 7  
 Parameter Group Number: 65173 (0x00FE95)

Start Position	Length	Parameter Name	SPN
1-4	4 bytes	Engine Operation Time Since Rebuild	1193

**(R) PGN 65174****Turbocharger Wastegate****TCW**

Transmission Repetition Rate: 100 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 150 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 65174 (0x00FE96)

Start Position	Length	Parameter Name	SPN
1	1 byte	Engine Turbocharger Wastegate Actuator 1 Position	1188
2	1 byte	Engine Turbocharger Wastegate Actuator 2 Position	1189
3	1 byte	Engine Turbocharger Wastegate Actuator 3 Position	1190
4	1 byte	Engine Turbocharger Wastegate Actuator 4 Position	1191
5	1 byte	Engine Turbocharger Wastegate Actuator Control Air Pressure	1192
6	1 byte	Engine Desired Turbocharger Wastegate Actuator 1 Position	5370
7.1	5 bits	Engine Turbocharger Wastegate Actuator 1 Preliminary FMI	5371
7.6	3 bits	Engine Turbocharger Wastegate Actuator 1 Temperature Status	5372
8	1 byte	Engine Desired Turbocharger Wastegate Actuator 2 Position	5373

**PGN 65175****Turbocharger Information 5****TCI5**

Transmission Repetition Rate: 1 s  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 151 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 65175 (0x00FE97)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Engine Turbocharger 1 Turbine Outlet Temperature	1184
3-4	2 bytes	Engine Turbocharger 2 Turbine Outlet Temperature	1185
5-6	2 bytes	Engine Turbocharger 3 Turbine Outlet Temperature	1186
7-8	2 bytes	Engine Turbocharger 4 Turbine Outlet Temperature	1187

**PGN 65176 Turbocharger Information 4****TCI4**

Transmission Repetition Rate: 1 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 152 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 65176 (0x00FE98)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Engine Turbocharger 1 Turbine Intake Temperature	1180
3-4	2 bytes	Engine Turbocharger 2 Turbine Intake Temperature	1181
5-6	2 bytes	Engine Turbocharger 3 Turbine Intake Temperature	1182
7-8	2 bytes	Engine Turbocharger 4 Turbine Intake Temperature	1183

**PGN 65177 Turbocharger Information 3****TCI3**

Transmission Repetition Rate: 1 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 153 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 65177 (0x00FE99)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Engine Turbocharger 1 Compressor Intake Pressure	1176
3-4	2 bytes	Engine Turbocharger 2 Compressor Intake Pressure	1177
5-6	2 bytes	Engine Turbocharger 3 Compressor Intake Pressure	1178
7-8	2 bytes	Engine Turbocharger 4 Compressor Intake Pressure	1179

**PGN 65178 Turbocharger Information 2****TCI2**

Transmission Repetition Rate: 1 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 154 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 65178 (0x00FE9A)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Engine Turbocharger 1 Compressor Intake Temperature	1172
3-4	2 bytes	Engine Turbocharger 2 Compressor Intake Temperature	1173
5-6	2 bytes	Engine Turbocharger 3 Compressor Intake Temperature	1174
7-8	2 bytes	Engine Turbocharger 4 Compressor Intake Temperature	1175

**PGN 65179 Turbocharger Information 1****TCI1**

Transmission Repetition Rate: 1 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 155 PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 65179 (0x00FE9B)

Start Position	Length	Parameter Name	SPN
1	1 byte	Engine Turbocharger Lube Oil Pressure 2	1168
2-3	2 bytes	Engine Turbocharger 2 Speed	1169
4-5	2 bytes	Engine Turbocharger 3 Speed	1170
6-7	2 bytes	Engine Turbocharger 4 Speed	1171

**PGN 65180 Main Bearing Temperature 3****MBT3**

Transmission Repetition Rate: 1 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 156 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 65180 (0x00FE9C)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Engine Main Bearing 9 Temperature	1165
3-4	2 bytes	Engine Main Bearing 10 Temperature	1166
5-6	2 bytes	Engine Main Bearing 11 Temperature	1167

**PGN 65181 Main Bearing Temperature 2****MBT2**

Transmission Repetition Rate: 1 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 157 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 65181 (0x00FE9D)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Engine Main Bearing 5 Temperature	1161
3-4	2 bytes	Engine Main Bearing 6 Temperature	1162
5-6	2 bytes	Engine Main Bearing 7 Temperature	1163
7-8	2 bytes	Engine Main Bearing 8 Temperature	1164



**PGN 65182 Main Bearing Temperature 1****MBT1**

Transmission Repetition Rate: 1 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 158 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 65182 (0x00FE9E)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Engine Main Bearing 1 Temperature	1157
3-4	2 bytes	Engine Main Bearing 2 Temperature	1158
5-6	2 bytes	Engine Main Bearing 3 Temperature	1159
7-8	2 bytes	Engine Main Bearing 4 Temperature	1160

**PGN 65183 Exhaust Port Temperature 5****EPT5**

Transmission Repetition Rate: 1 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 159 PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 65183 (0x00FE9F)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Engine Exhaust Gas Port 17 Temperature	1153
3-4	2 bytes	Engine Exhaust Gas Port 18 Temperature	1154
5-6	2 bytes	Engine Exhaust Gas Port 19 Temperature	1155
7-8	2 bytes	Engine Exhaust Gas Port 20 Temperature	1156

**PGN 65184 Exhaust Port Temperature 4****EPT4**

Transmission Repetition Rate: 1 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 160 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 65184 (0x00FEA0)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Engine Exhaust Gas Port 13 Temperature	1149
3-4	2 bytes	Engine Exhaust Gas Port 14 Temperature	1150
5-6	2 bytes	Engine Exhaust Gas Port 15 Temperature	1151
7-8	2 bytes	Engine Exhaust Gas Port 16 Temperature	1152

**PGN 65185 Exhaust Port Temperature 3****EPT3**

Transmission Repetition Rate: 1 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 161 PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 65185 (0x00FEA1)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Engine Exhaust Gas Port 9 Temperature	1145
3-4	2 bytes	Engine Exhaust Gas Port 10 Temperature	1146
5-6	2 bytes	Engine Exhaust Gas Port 11 Temperature	1147
7-8	2 bytes	Engine Exhaust Gas Port 12 Temperature	1148

**PGN 65186 Exhaust Port Temperature 2****EPT2**

Transmission Repetition Rate: 1 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 162 PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 65186 (0x00FEA2)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Engine Exhaust Gas Port 5 Temperature	1141
3-4	2 bytes	Engine Exhaust Gas Port 6 Temperature	1142
5-6	2 bytes	Engine Exhaust Gas Port 7 Temperature	1143
7-8	2 bytes	Engine Exhaust Gas Port 8 Temperature	1144

**PGN 65187 Exhaust Port Temperature 1****EPT1**

Transmission Repetition Rate: 1 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 163 PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 65187 (0x00FEA3)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Engine Exhaust Gas Port 1 Temperature	1137
3-4	2 bytes	Engine Exhaust Gas Port 2 Temperature	1138
5-6	2 bytes	Engine Exhaust Gas Port 3 Temperature	1139
7-8	2 bytes	Engine Exhaust Gas Port 4 Temperature	1140

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**PGN 65188****Engine Temperature 2****ET2**

Transmission Repetition Rate: 1s  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 164 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 65188 (0x00FEA4)

| Start Position | Length  | Parameter Name                                           | SPN  |
|----------------|---------|----------------------------------------------------------|------|
| 1-2            | 2 bytes | Engine Oil Temperature 2                                 | 1135 |
| 3-4            | 2 bytes | Engine ECU Temperature                                   | 1136 |
| 5-6            | 2 bytes | Engine Exhaust Gas Recirculation 1 Differential Pressure | 411  |
| 7-8            | 2 bytes | Engine Exhaust Gas Recirculation 1 Temperature           | 412  |

**PGN 65189****Intake Manifold Information 2****IMT2**

Transmission Repetition Rate: 1 s  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 165 PGN Supporting Information:  
 Default Priority: 7  
 Parameter Group Number: 65189 (0x00FEA5)

| Start Position | Length | Parameter Name                       | SPN  |
|----------------|--------|--------------------------------------|------|
| 1              | 1 byte | Engine Intake Manifold 2 Temperature | 1131 |
| 2              | 1 byte | Engine Intake Manifold 3 Temperature | 1132 |
| 3              | 1 byte | Engine Intake Manifold 4 Temperature | 1133 |
| 4              | 1 byte | Engine Intake Manifold 5 Temperature | 1802 |
| 5              | 1 byte | Engine Intake Manifold 6 Temperature | 1803 |

**PGN 65190****Intake Manifold Information 1****IMT1**

Transmission Repetition Rate: 0.5 s  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 166 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 65190 (0x00FEA6)

| Start Position | Length  | Parameter Name                       | SPN  |
|----------------|---------|--------------------------------------|------|
| 1-2            | 2 bytes | Engine Turbocharger 1 Boost Pressure | 1127 |
| 3-4            | 2 bytes | Engine Turbocharger 2 Boost Pressure | 1128 |
| 5-6            | 2 bytes | Engine Turbocharger 3 Boost Pressure | 1129 |
| 7-8            | 2 bytes | Engine Turbocharger 4 Boost Pressure | 1130 |

**PGN 65191****Alternator Temperature****AT**

Transmission Repetition Rate: 1 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 167 PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 65191 (0x00FEA7)

| Start Position | Length | Parameter Name                          | SPN  |
|----------------|--------|-----------------------------------------|------|
| 1              | 1 byte | Engine Alternator Bearing 1 Temperature | 1122 |
| 2              | 1 byte | Engine Alternator Bearing 2 Temperature | 1123 |
| 3              | 1 byte | Engine Alternator Winding 1 Temperature | 1124 |
| 4              | 1 byte | Engine Alternator Winding 2 Temperature | 1125 |
| 5              | 1 byte | Engine Alternator Winding 3 Temperature | 1126 |

**PGN 65192****Articulation Control****AC**

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 168 PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 65192 (0x00FEA8)

| Start Position | Length | Parameter Name     | SPN  |
|----------------|--------|--------------------|------|
| 1              | 1 byte | Articulation Angle | 1120 |

**PGN 65193****Exhaust Oxygen 1****EO1**

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 169 PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 65193 (0x00FEA9)

| Start Position | Length  | Parameter Name                                         | SPN  |
|----------------|---------|--------------------------------------------------------|------|
| 1-2            | 2 bytes | Engine Desired Rated Exhaust Oxygen                    | 1117 |
| 3-4            | 2 bytes | Engine Desired Exhaust Oxygen                          | 1118 |
| 5-6            | 2 bytes | Engine Actual Exhaust Oxygen                           | 1119 |
| 7              | 1 byte  | Engine Exhaust Gas Oxygen Sensor Fueling Correction    | 1695 |
| 8.7            | 2 bits  | Engine Exhaust Gas Oxygen Sensor Closed Loop Operation | 1696 |

**PGN 65194****Alternate Fuel 2****AF2**

Transmission Repetition Rate: On request  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 170 PGN Supporting Information:  
 Default Priority: 7  
 Parameter Group Number: 65194 (0x00FEAA)

| Start Position | Length  | Parameter Name                                                       | SPN  |
|----------------|---------|----------------------------------------------------------------------|------|
| 1              | 1 byte  | Engine Gaseous Fuel Correction Factor                                | 1116 |
| 2-3            | 2 bytes | Engine Desired Absolute Intake Manifold Pressure (Turbo Boost Limit) | 1692 |
| 4              | 1 byte  | Engine Turbocharger Wastegate Valve Position                         | 1693 |
| 5              | 1 byte  | Engine Gas Mass Flow Sensor Fueling Correction                       | 1694 |

**PGN 65195****Electronic Transmission Controller 6****ETC6**

Transmission Repetition Rate: On request  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 171 PGN Supporting Information:  
 Default Priority: 7  
 Parameter Group Number: 65195 (0x00FEAB)

| Start Position | Length | Parameter Name        | SPN  |
|----------------|--------|-----------------------|------|
| 1              | 1 byte | Recommended Gear      | 1113 |
| 2              | 1 byte | Highest Possible Gear | 1115 |
| 3              | 1 byte | Lowest Possible Gear  | 1114 |
| 4              | 1 byte | Clutch Life Remaining | 2983 |

**PGN 65196****Wheel Brake Lining Remaining Information****EBC4**

Transmission Repetition Rate: On request  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 172 PGN Supporting Information:  
 Default Priority: 7  
 Parameter Group Number: 65196 (0x00FEAC)

| Start Position | Length | Parameter Name                                    | SPN  |
|----------------|--------|---------------------------------------------------|------|
| 1              | 1 byte | Brake Lining Remaining, Front Axle, Left Wheel    | 1099 |
| 2              | 1 byte | Brake Lining Remaining, Front Axle, Right Wheel   | 1100 |
| 3              | 1 byte | Brake Lining Remaining, Rear Axle #1, Left Wheel  | 1101 |
| 4              | 1 byte | Brake Lining Remaining, Rear Axle #1, Right Wheel | 1102 |
| 5              | 1 byte | Brake Lining Remaining, Rear Axle #2, Left Wheel  | 1103 |
| 6              | 1 byte | Brake Lining Remaining, Rear Axle #2, Right Wheel | 1104 |
| 7              | 1 byte | Brake Lining Remaining, Rear Axle #3, Left Wheel  | 1105 |
| 8              | 1 byte | Brake Lining Remaining, Rear Axle #3, Right Wheel | 1106 |

**PGN 65197****Wheel Application Pressure High Range Information****EBC3**

Transmission Repetition Rate: 100 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 173 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 65197 (0x00FEAD)

| Start Position | Length | Parameter Name                                                   | SPN  |
|----------------|--------|------------------------------------------------------------------|------|
| 1              | 1 byte | Brake Application Pressure High Range, Front Axle, Left Wheel    | 1091 |
| 2              | 1 byte | Brake Application Pressure High Range, Front Axle, Right Wheel   | 1092 |
| 3              | 1 byte | Brake Application Pressure High Range, Rear Axle #1, Left Wheel  | 1093 |
| 4              | 1 byte | Brake Application Pressure High Range, Rear Axle #1, Right Wheel | 1094 |
| 5              | 1 byte | Brake Application Pressure High Range, Rear Axle #2, Left Wheel  | 1095 |
| 6              | 1 byte | Brake Application Pressure High Range, Rear Axle #2, Right Wheel | 1096 |
| 7              | 1 byte | Brake Application Pressure High Range, Rear Axle #3, Left Wheel  | 1097 |
| 8              | 1 byte | Brake Application Pressure High Range, Rear Axle #3, Right Wheel | 1098 |

**PGN 65198****Air Supply Pressure****AIR1**

Air Supply Pressure

Transmission Repetition Rate: 1 sec  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 174 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 65198 (0x00FEAE)

| Start Position | Length | Parameter Name                       | SPN  |
|----------------|--------|--------------------------------------|------|
| 1              | 1 byte | Pneumatic Supply Pressure            | 46   |
| 2              | 1 byte | Parking and/or Trailer Air Pressure  | 1086 |
| 3              | 1 byte | Service Brake Circuit 1 Air Pressure | 1087 |
| 4              | 1 byte | Service Brake Circuit 2 Air Pressure | 1088 |
| 5              | 1 byte | Auxiliary Equipment Supply Pressure  | 1089 |
| 6              | 1 byte | Air Suspension Supply Pressure       | 1090 |
| 7.1            | 2 bits | Air Compressor Status                | 1351 |

**PGN 65199 Fuel Consumption (Gaseous)****GFC**

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 175 PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 65199 (0x00FEAF)

| Start Position | Length  | Parameter Name            | SPN  |
|----------------|---------|---------------------------|------|
| 1-4            | 4 bytes | Trip Fuel (Gaseous)       | 1039 |
| 5-8            | 4 bytes | Total Fuel Used (Gaseous) | 1040 |

**PGN 65200 Trip Time Information 2****TTI2**

Transmission Repetition Rate: On request  
Data Length: 20  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 176 PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 65200 (0x00FEB0)

| Start Position | Length  | Parameter Name              | SPN  |
|----------------|---------|-----------------------------|------|
| 01-04          | 4 bytes | Trip Cruise Time            | 1034 |
| 05-08          | 4 bytes | Trip PTO Governor Time      | 1035 |
| 09-12          | 4 bytes | Trip Engine Running Time    | 1036 |
| 13-16          | 4 bytes | Trip Idle Time              | 1037 |
| 17-20          | 4 bytes | Trip Air Compressor On Time | 1038 |

**PGN 65201 ECU History****EH**

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 177 PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 65201 (0x00FEB1)

| Start Position | Length  | Parameter Name     | SPN  |
|----------------|---------|--------------------|------|
| 1-4            | 4 bytes | Total ECU Distance | 1032 |
| 5-8            | 4 bytes | Total ECU Run Time | 1033 |

**PGN 65202      Fuel Information 1 (Gaseous)****GFI1**

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 178      PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 65202 (0x00FEB2)

| Start Position | Length  | Parameter Name                                | SPN  |
|----------------|---------|-----------------------------------------------|------|
| 1-4            | 4 bytes | Total Engine PTO Governor Fuel Used (Gaseous) | 1030 |
| 5-6            | 2 bytes | Trip Average Fuel Rate (Gaseous)              | 1031 |
| 7-8            | 2 bytes | Engine Fuel Specific Gravity                  | 1389 |

**(R) PGN 65203      Fuel Information (Liquid)****LFI**

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 179      PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 65203 (0x00FEB3)

| Start Position | Length  | Parameter Name                      | SPN  |
|----------------|---------|-------------------------------------|------|
| 1-4            | 4 bytes | Total Engine PTO Governor Fuel Used | 1028 |
| 5-6            | 2 bytes | Trip Average Fuel Rate              | 1029 |
| 7-8            | 2 bytes | Flexible Fuel Percentage            | 5458 |

**PGN 65204      Trip Time Information 1****TTI1**

Transmission Repetition Rate: On request  
Data Length: 16  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 180      PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 65204 (0x00FEB4)

| Start Position | Length  | Parameter Name                | SPN  |
|----------------|---------|-------------------------------|------|
| 01-04          | 4 bytes | Trip Time in VSL              | 1024 |
| 05-08          | 4 bytes | Trip Time in Top Gear         | 1025 |
| 09-12          | 4 bytes | Trip Time in Gear Down        | 1026 |
| 13-16          | 4 bytes | Trip Time in Derate by Engine | 1027 |



**PGN 65205 Trip Shutdown Information****TSI**

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 181 PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 65205 (0x00FEB5)

| Start Position | Length  | Parameter Name                         | SPN  |
|----------------|---------|----------------------------------------|------|
| 1-2            | 2 bytes | Trip Number of Hot Shutdowns           | 1020 |
| 3-4            | 2 bytes | Trip Number of Idle Shutdowns          | 1021 |
| 5-6            | 2 bytes | Trip Number of Idle Shutdown Overrides | 1022 |
| 7-8            | 2 bytes | Trip Sudden Decelerations              | 1023 |

**PGN 65206 Trip Vehicle Speed/Cruise Distance Information****TVI**

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 182 PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 65206 (0x00FEB6)

| Start Position | Length  | Parameter Name             | SPN  |
|----------------|---------|----------------------------|------|
| 1-2            | 2 bytes | Trip Maximum Vehicle Speed | 1018 |
| 3-6            | 4 bytes | Trip Cruise Distance       | 1019 |

**PGN 65207 Engine Speed/Load Factor Information****LF**

Transmission Repetition Rate: On request  
Data Length: 10  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 183 PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 65207 (0x00FEB7)

| Start Position | Length  | Parameter Name                  | SPN  |
|----------------|---------|---------------------------------|------|
| 1-2            | 2 bytes | Trip Maximum Engine Speed       | 1013 |
| 3-4            | 2 bytes | Trip Average Engine Speed       | 1014 |
| 5              | 1 byte  | Trip Drive Average Load Factor  | 1015 |
| 6              | 1 byte  | Total Drive Average Load Factor | 1016 |
| 7-10           | 4 bytes | Total Engine Cruise Time        | 1017 |

**PGN 65208 Trip Fuel Information (Gaseous)****GTFI**

Transmission Repetition Rate: On request  
 Data Length: 22  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 184 PGN Supporting Information:  
 Default Priority: 7  
 Parameter Group Number: 65208 (0x00FEB8)

| Start Position | Length  | Parameter Name                                   | SPN  |
|----------------|---------|--------------------------------------------------|------|
| 01-04          | 4 bytes | Trip Drive Fuel Used (Gaseous)                   | 1007 |
| 05-08          | 4 bytes | Trip PTO Governor Moving Fuel Used (Gaseous)     | 1008 |
| 09-12          | 4 bytes | Trip PTO Governor Non-moving Fuel Used (Gaseous) | 1009 |
| 13-16          | 4 bytes | Trip Vehicle Idle Fuel Used (Gaseous)            | 1010 |
| 17-20          | 4 bytes | Trip Cruise Fuel Used (Gaseous)                  | 1011 |
| 21-22          | 2 bytes | Trip Drive Fuel Economy (Gaseous)                | 1012 |

**PGN 65209 Trip Fuel Information (Liquid)****LTFI**

Transmission Repetition Rate: On request  
 Data Length: 22  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 185 PGN Supporting Information:  
 Default Priority: 7  
 Parameter Group Number: 65209 (0x00FEB9)

| Start Position | Length  | Parameter Name                         | SPN  |
|----------------|---------|----------------------------------------|------|
| 01-04          | 4 bytes | Trip Drive Fuel Used                   | 1001 |
| 05-08          | 4 bytes | Trip PTO Governor Moving Fuel Used     | 1002 |
| 09-12          | 4 bytes | Trip PTO Governor Non-moving Fuel Used | 1003 |
| 13-16          | 4 bytes | Trip Vehicle Idle Fuel Used            | 1004 |
| 17-20          | 4 bytes | Trip Cruise Fuel Used                  | 1005 |
| 21-22          | 2 bytes | Trip Drive Fuel Economy                | 1006 |

**PGN 65210 Trip Distance Information****TDI**

Transmission Repetition Rate: On request  
 Data Length: 12  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 186 PGN Supporting Information:  
 Default Priority: 7  
 Parameter Group Number: 65210 (0x00FEBA)

| Start Position | Length  | Parameter Name            | SPN  |
|----------------|---------|---------------------------|------|
| 1-4            | 4 bytes | Trip Distance on VSL      | 998  |
| 5-8            | 4 bytes | Trip Gear Down Distance   | 999  |
| 9-12           | 4 bytes | Trip Distance in Top Gear | 1000 |

**PGN 65211 Trip Fan Information****TFI**

Transmission Repetition Rate: On request  
 Data Length: 16  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 187 PGN Supporting Information:  
 Default Priority: 7  
 Parameter Group Number: 65211 (0x00FEBB)

| Start Position | Length  | Parameter Name                            | SPN |
|----------------|---------|-------------------------------------------|-----|
| 01-04          | 4 bytes | Trip Fan On Time                          | 994 |
| 05-08          | 4 bytes | Trip Fan On Time Due to the Engine System | 995 |
| 09-12          | 4 bytes | Trip Fan On Time Due to a Manual Switch   | 996 |
| 13-16          | 4 bytes | Trip Fan On Time Due to the A/C System    | 997 |

**PGN 65212 Compression/Service Brake Information****CBI**

Transmission Repetition Rate: On request  
 Data Length: 16  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 188 PGN Supporting Information:  
 Default Priority: 7  
 Parameter Group Number: 65212 (0x00FEBB)

| Start Position | Length  | Parameter Name                   | SPN |
|----------------|---------|----------------------------------|-----|
| 01-04          | 4 bytes | Total Compression Brake Distance | 990 |
| 05-08          | 4 bytes | Trip Compression Brake Distance  | 991 |
| 09-12          | 4 bytes | Trip Service Brake Distance      | 992 |
| 13-16          | 4 bytes | Trip Service Brake Applications  | 993 |

**PGN 65213 Fan Drive****FD**

Transmission Repetition Rate: 1 s  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 189 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 65213 (0x00FEBD)

| Start Position | Length  | Parameter Name                  | SPN  |
|----------------|---------|---------------------------------|------|
| 1              | 1 byte  | Estimated Percent Fan Speed     | 975  |
| 2.1            | 4 bits  | Fan Drive State                 | 977  |
| 3-4            | 2 bytes | Fan Speed                       | 1639 |
| 5-6            | 2 bytes | Hydraulic Fan Motor Pressure    | 4211 |
| 7              | 1 byte  | Fan Drive Bypass Command Status | 4212 |

**(R) PGN 65214      Electronic Engine Controller 4****EEC4**

Transmission Repetition Rate:      On request  
Data Length:      8  
Extended Data Page:      0  
Data Page:      0  
PDU Format:      254  
PDU Specific:      190      PGN Supporting Information:  
Default Priority:      7  
Parameter Group Number:      65214 (0x00FEBE)

| Start Position | Length  | Parameter Name                               | SPN  |
|----------------|---------|----------------------------------------------|------|
| 1-2            | 2 bytes | Engine Rated Power                           | 166  |
| 3-4            | 2 bytes | Engine Rated Speed                           | 189  |
| 5.1            | 2 bits  | Engine Rotation Direction                    | 3669 |
| 5.3            | 2 bits  | Engine Intake Manifold Pressure Control Mode | 5465 |
| 6              | 1 byte  | Crank Attempt Count on Present Start Attempt | 3671 |

**PGN 65215      Wheel Speed Information****EBC2**

Transmission Repetition Rate:      100 ms  
Data Length:      8  
Extended Data Page:      0  
Data Page:      0  
PDU Format:      254  
PDU Specific:      191      PGN Supporting Information:  
Default Priority:      6  
Parameter Group Number:      65215 (0x00FEBF)

| Start Position | Length  | Parameter Name                            | SPN |
|----------------|---------|-------------------------------------------|-----|
| 1-2            | 2 bytes | Front Axle Speed                          | 904 |
| 3              | 1 byte  | Relative Speed; Front Axle, Left Wheel    | 905 |
| 4              | 1 byte  | Relative Speed; Front Axle, Right Wheel   | 906 |
| 5              | 1 byte  | Relative Speed; Rear Axle #1, Left Wheel  | 907 |
| 6              | 1 byte  | Relative Speed; Rear Axle #1, Right Wheel | 908 |
| 7              | 1 byte  | Relative Speed; Rear Axle #2, Left Wheel  | 909 |
| 8              | 1 byte  | Relative Speed; Rear Axle #2, Right Wheel | 910 |

**PGN 65216****Service Information****SERV**

Transmitted with the service component identification that has the shortest distance or nearest time until the next service inspection.

NOTE - There are two acceptable formats for the Service PGN. Format 1 has only 8 bytes of data and reports the component most in need of service for each of the three categories. Format 2, however, uses the transport layer as necessary in order to repeat these 8 bytes of service component information until all supported service components in each category have been transmitted.

Transmission Repetition Rate: On request  
Data Length: 8 bytes or variable  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 192 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 65216 (0x00FEC0)

| Start Position | Length  | Parameter Name                       | SPN |
|----------------|---------|--------------------------------------|-----|
| 1              | 1 byte  | Service Component Identification     | 911 |
| 2-3            | 2 bytes | Service Distance                     | 914 |
| 4              | 1 byte  | Service Component Identification     | 912 |
| 5              | 1 byte  | Service Delay/Calendar Time Based    | 915 |
| 6              | 1 byte  | Service Component Identification     | 913 |
| 7-8            | 2 bytes | Service Delay/Operational Time Based | 916 |

**PGN 65217****High Resolution Vehicle Distance****VDHR**

Transmission Repetition Rate: 1 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 193 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 65217 (0x00FEC1)

| Start Position | Length  | Parameter Name                         | SPN |
|----------------|---------|----------------------------------------|-----|
| 1-4            | 4 bytes | High Resolution Total Vehicle Distance | 917 |
| 5-8            | 4 bytes | High Resolution Trip Distance          | 918 |

**PGN 65218****Electronic Retarder Controller 2****ERC2**

Transmission Repetition Rate: Every 1 s and on change of state but no faster than every 100 ms. Grandfathered definition for systems that implemented this message prior to July, 2010: 1 s when active; or on change of state

Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 194 PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 65218 (0x00FEC2)

| Start Position | Length | Parameter Name               | SPN |
|----------------|--------|------------------------------|-----|
| 1.1            | 2 bits | Transmission Output Retarder | 748 |

**PGN 65219****Electronic Transmission Controller 5****ETC5**

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 195 PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 65219 (0x00FEC3)

| Start Position | Length | Parameter Name                        | SPN |
|----------------|--------|---------------------------------------|-----|
| 1.1            | 2 bits | Transmission High Range Sense Switch  | 778 |
| 1.3            | 2 bits | Transmission Low Range Sense Switch   | 779 |
| 2.1            | 2 bits | Transmission Reverse Direction Switch | 767 |
| 2.3            | 2 bits | Transmission Neutral Switch           | 604 |
| 2.5            | 2 bits | Transmission Forward Direction Switch | 903 |

**PGN 65221****Electronic Transmission Controller 4****ETC4**

Transmission Repetition Rate: On request  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 197 PGN Supporting Information:  
Default Priority: 7  
Parameter Group Number: 65221 (0x00FEC5)

| Start Position | Length | Parameter Name                         | SPN |
|----------------|--------|----------------------------------------|-----|
| 1              | 1 byte | Transmission Synchronizer Clutch Value | 53  |
| 2              | 1 byte | Transmission Synchronizer Brake Value  | 54  |

**PGN 65223****Electronic Transmission Controller 3****ETC3**

Transmission Repetition Rate: On request  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 199 PGN Supporting Information:  
 Default Priority: 7  
 Parameter Group Number: 65223 (0x00FEC7)

| Start Position | Length | Parameter Name                                  | SPN |
|----------------|--------|-------------------------------------------------|-----|
| 1              | 1 byte | Transmission Shift Finger Gear Position         | 59  |
| 2              | 1 byte | Transmission Shift Finger Rail Position         | 60  |
| 3.1            | 2 bits | Transmission Shift Finger Neutral Indicator     | 780 |
| 3.3            | 2 bits | Transmission Shift Finger Engagement Indicator  | 781 |
| 3.5            | 2 bits | Transmission Shift Finger Center Rail Indicator | 782 |
| 4.1            | 2 bits | Transmission Shift Finger Rail Actuator 1       | 772 |
| 4.3            | 2 bits | Transmission Shift Finger Gear Actuator 1       | 773 |
| 4.5            | 2 bits | Transmission Shift Finger Rail Actuator 2       | 783 |
| 4.7            | 2 bits | Transmission Shift Finger Gear Actuator 2       | 784 |
| 5.1            | 2 bits | Transmission Range High Actuator                | 768 |
| 5.3            | 2 bits | Transmission Range Low Actuator                 | 769 |
| 5.5            | 2 bits | Transmission Splitter Direct Actuator           | 770 |
| 5.7            | 2 bits | Transmission Splitter Indirect Actuator         | 771 |
| 6.1            | 2 bits | Transmission Clutch Actuator                    | 788 |
| 6.3            | 2 bits | Transmission Lockup Clutch Actuator             | 740 |
| 6.5            | 2 bits | Transmission Defuel Actuator                    | 786 |
| 6.7            | 2 bits | Transmission Inertia Brake Actuator             | 787 |

**PGN 65237****Alternator Information****AS**

Transmission Repetition Rate: 1 sec  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 213 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 65237 (0x00FED5)

| Start Position | Length  | Parameter Name      | SPN  |
|----------------|---------|---------------------|------|
| 1-2            | 2 bytes | Alternator Speed    | 589  |
| 3.1            | 2 bits  | Alternator 1 Status | 3353 |
| 3.3            | 2 bits  | Alternator 2 Status | 3354 |
| 3.5            | 2 bits  | Alternator 3 Status | 3355 |
| 3.7            | 2 bits  | Alternator 4 Status | 3356 |

**PGN 65241****Auxiliary Input/Output Status 1****AUXIO1**

## Notes:

Implementers are encouraged to use specific functional SPNs whenever possible.

AUXIO PGNs are intended for two categories of use in which fixed mapping to functions is not possible:

- 1) Generic I/O devices
- 2) Applications lacking defined input and output functionality.

Use, or request new, functionally defined parameters in all other cases.

Implementers and integrators considering using AUXIO PGNs should be cautious of conflicts that can arise from multiple users on a single system.

|                               |                                              |                             |  |
|-------------------------------|----------------------------------------------|-----------------------------|--|
| Transmission Repetition Rate: | manufacturer defined, not faster than 100 ms |                             |  |
| Data Length:                  | 8                                            |                             |  |
| Extended Data Page:           | 0                                            |                             |  |
| Data Page:                    | 0                                            |                             |  |
| PDU Format:                   | 254                                          |                             |  |
| PDU Specific:                 | 217                                          | PGN Supporting Information: |  |
| Default Priority:             | 6                                            |                             |  |
| Parameter Group Number:       | 65241 (0x00FED9)                             |                             |  |

| Start Position | Length  | Parameter Name           | SPN  |
|----------------|---------|--------------------------|------|
| 1.1            | 2 bits  | Auxiliary I/O #04        | 704  |
| 1.3            | 2 bits  | Auxiliary I/O #03        | 703  |
| 1.5            | 2 bits  | Auxiliary I/O #02        | 702  |
| 1.7            | 2 bits  | Auxiliary I/O #01        | 701  |
| 2.1            | 2 bits  | Auxiliary I/O #08        | 708  |
| 2.3            | 2 bits  | Auxiliary I/O #07        | 707  |
| 2.5            | 2 bits  | Auxiliary I/O #06        | 706  |
| 2.7            | 2 bits  | Auxiliary I/O #05        | 705  |
| 3.1            | 2 bits  | Auxiliary I/O #12        | 712  |
| 3.3            | 2 bits  | Auxiliary I/O #11        | 711  |
| 3.5            | 2 bits  | Auxiliary I/O #10        | 710  |
| 3.7            | 2 bits  | Auxiliary I/O #09        | 709  |
| 4.1            | 2 bits  | Auxiliary I/O #16        | 716  |
| 4.3            | 2 bits  | Auxiliary I/O #15        | 715  |
| 4.5            | 2 bits  | Auxiliary I/O #14        | 714  |
| 4.7            | 2 bits  | Auxiliary I/O #13        | 713  |
| 5-6            | 2 bytes | Auxiliary I/O Channel #1 | 1083 |
| 7-8            | 2 bytes | Auxiliary I/O Channel #2 | 1084 |



**PGN 65242      Software Identification****SOFT**

Byte: 1 Number of software identification fields  
2-n Software identification(s)  
Delimiter (ASCII "\*\*")

NOTE- The software identification field is variable in length and may contain up to 125 software identification designators. An ASCII "\*\*" is used as a delimiter to separate multiple software identifications. Additional software identification fields may be added at the end, each separated by an ASCII "\*\*" as a delimiter. An ASCII "\*\*" is required at the end of the last software identification field, even if there is only one software identification designator.

Transmission Repetition Rate:      On request  
Data Length:                          Variable  
Extended Data Page:                  0  
Data Page:                              0  
PDU Format:                            254  
PDU Specific:                        218                      PGN Supporting Information:  
Default Priority:                      6  
Parameter Group Number:            65242 (0x00FEDA)

| Start Position | Length                                                   | Parameter Name                           | SPN |
|----------------|----------------------------------------------------------|------------------------------------------|-----|
| 1              | 1 byte                                                   | Number of Software Identification Fields | 965 |
| 2-N            | Variable - up to 200 bytes followed by an "**" delimiter | Software Identification                  | 234 |

**PGN 65243      Engine Fluid Level/Pressure 2****EFL/P2**

Transmission Repetition Rate:      0.5 s  
Data Length:                            8  
Extended Data Page:                  0  
Data Page:                              0  
PDU Format:                            254  
PDU Specific:                        219                      PGN Supporting Information:  
Default Priority:                      6  
Parameter Group Number:            65243 (0x00FEDB)

| Start Position | Length  | Parameter Name                           | SPN  |
|----------------|---------|------------------------------------------|------|
| 1-2            | 2 bytes | Engine Injection Control Pressure        | 164  |
| 3-4            | 2 bytes | Engine Injector Metering Rail 1 Pressure | 157  |
| 5-6            | 2 bytes | Engine Injector Timing Rail 1 Pressure   | 156  |
| 7-8            | 2 bytes | Engine Injector Metering Rail 2 Pressure | 1349 |

**PGN 65244**      **Idle Operation****IO**

Transmission Repetition Rate:    On request  
Data Length:                        Variable  
Extended Data Page:                0  
Data Page:                            0  
PDU Format:                           254  
PDU Specific:                        220                    PGN Supporting Information:  
Default Priority:                     6  
Parameter Group Number:        65244 (0x00FEDC)

| Start Position | Length  | Parameter Name              | SPN |
|----------------|---------|-----------------------------|-----|
| 1-4            | 4 bytes | Engine Total Idle Fuel Used | 236 |
| 5-8            | 4 bytes | Engine Total Idle Hours     | 235 |

**PGN 65245**      **Turbocharger****TC**

Transmission Repetition Rate:    1 s  
Data Length:                        8  
Extended Data Page:                0  
Data Page:                            0  
PDU Format:                           254  
PDU Specific:                        221                    PGN Supporting Information:  
Default Priority:                     6  
Parameter Group Number:        65245 (0x00FEDD)

| Start Position | Length  | Parameter Name                          | SPN  |
|----------------|---------|-----------------------------------------|------|
| 1              | 1 byte  | Engine Turbocharger Lube Oil Pressure 1 | 104  |
| 2-3            | 2 bytes | Engine Turbocharger 1 Speed             | 103  |
| 4.7            | 2 bits  | Engine Turbocharger Oil Level Switch    | 1665 |

**PGN 65246**      **Air Start Pressure****AIR2**

Transmission Repetition Rate:    On request  
Data Length:                        8  
Extended Data Page:                0  
Data Page:                            0  
PDU Format:                           254  
PDU Specific:                        222                    PGN Supporting Information:  
Default Priority:                     6  
Parameter Group Number:        65246 (0x00FEDE)

| Start Position | Length | Parameter Name            | SPN |
|----------------|--------|---------------------------|-----|
| 1              | 1 byte | Engine Air Start Pressure | 82  |

**PGN 65247****Electronic Engine Controller 3****EEC3**

Transmission Repetition Rate: 250 msec (preferred) or Engine Speed Dependent (if required by application)  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 223 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 65247 (0x00FEDF)

| Start Position | Length  | Parameter Name                                        | SPN  |
|----------------|---------|-------------------------------------------------------|------|
| 1              | 1 byte  | Nominal Friction - Percent Torque                     | 514  |
| 2-3            | 2 bytes | Engine's Desired Operating Speed                      | 515  |
| 4              | 1 byte  | Engine's Desired Operating Speed Asymmetry Adjustment | 519  |
| 5              | 1 byte  | Estimated Engine Parasitic Losses - Percent Torque    | 2978 |
| 6-7            | 2 bytes | Aftertreatment 1 Exhaust Gas Mass Flow                | 3236 |
| 8.1            | 2 bits  | Aftertreatment 1 Intake Dew Point                     | 3237 |
| 8.3            | 2 bits  | Aftertreatment 1 Exhaust Dew Point                    | 3238 |
| 8.5            | 2 bits  | Aftertreatment 2 Intake Dew Point                     | 3239 |
| 8.7            | 2 bits  | Aftertreatment 2 Exhaust Dew Point                    | 3240 |

**PGN 65248****Vehicle Distance****VD**

Transmission Repetition Rate: 100 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 224 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 65248 (0x00FEE0)

| Start Position | Length  | Parameter Name         | SPN |
|----------------|---------|------------------------|-----|
| 1-4            | 4 bytes | Trip Distance          | 244 |
| 5-8            | 4 bytes | Total Vehicle Distance | 245 |

**PGN 65249 Retarder Configuration****RC**

This map describes the stationary behavior of the retarder.

Note: Grandfathered definition for systems that implemented this message prior to July, 2010: On change of torque/speed points of more than 10% since last transmission, or every 5 s.

Transmission Repetition Rate: Every 5 s and on change of torque/speed points of more than 10% since last transmission but no faster than every 500 ms

Data Length: 19

Extended Data Page: 0

Data Page: 0

PDU Format: 254

PDU Specific: 225 PGN Supporting Information: See Appendix D - PGN 65249

Default Priority: 6

Parameter Group Number: 65249 (0x00FEE1)

| Start Position | Length  | Parameter Name                                                    | SPN |
|----------------|---------|-------------------------------------------------------------------|-----|
| 01.1           | 4 bits  | Retarder Type                                                     | 901 |
| 01.5           | 4 bits  | Retarder Location                                                 | 902 |
| 02             | 1 byte  | Retarder Control Method (Retarder Configuration)                  | 557 |
| 03-04          | 2 bytes | Retarder Speed At Idle, Point 1 (Retarder Configuration)          | 546 |
| 05             | 1 byte  | Percent Torque At Idle, Point 1 (Retarder Configuration)          | 551 |
| 06-07          | 2 bytes | Maximum Retarder Speed, Point 2 (Retarder Configuration)          | 548 |
| 08             | 1 byte  | Percent Torque At Maximum Speed, Point 2 (Retarder Configuration) | 552 |
| 09-10          | 2 bytes | Retarder Speed At Point 3 (Retarder Configuration)                | 549 |
| 11             | 1 byte  | Percent Torque At Point 3 (Retarder Configuration)                | 553 |
| 12-13          | 2 bytes | Retarder Speed At Point 4 (Retarder Configuration)                | 550 |
| 14             | 1 byte  | Percent Torque At Point 4 (Retarder Configuration)                | 554 |
| 15-16          | 2 bytes | Retarder Speed At Peak Torque, Point 5 (Retarder Configuration)   | 547 |
| 17-18          | 2 bytes | Reference Retarder Torque (Retarder Configuration)                | 556 |
| 19             | 1 byte  | Percent Torque At Peak Torque, Point 5 (Retarder Configuration)   | 555 |

**PGN 65250      Transmission Configuration****TCFG**

Total message length depends on total number of forward and reverse gear ratios.

NOTE: The first gear ratio transmitted in bytes 3,4 will be the highest reverse gear ratio. Additional 2-byte gear ratios will follow:

3,4    Highest reverse gear ratio

.

.

a,b    Lowest reverse gear ratio

c,d    Lowest forward gear ratio

.

.

e,f    Highest forward gear ratio

|                               |                  |                             |
|-------------------------------|------------------|-----------------------------|
| Transmission Repetition Rate: | On request       |                             |
| Data Length:                  | Variable         |                             |
| Extended Data Page:           | 0                |                             |
| Data Page:                    | 0                |                             |
| PDU Format:                   | 254              |                             |
| PDU Specific:                 | 226              | PGN Supporting Information: |
| Default Priority:             | 6                |                             |
| Parameter Group Number:       | 65250 (0x00FEE2) |                             |

| Start Position | Length  | Parameter Name                | SPN |
|----------------|---------|-------------------------------|-----|
| 1              | 1 byte  | Number of Reverse Gear Ratios | 958 |
| 2              | 1 byte  | Number of Forward Gear Ratios | 957 |
| 3-4            | 2 bytes | Transmission Gear Ratio       | 581 |

**PGN 65251 Engine Configuration 1****EC1**

This map describes the stationary behavior of the engine and the speed dependent available indicated torque. This map should reflect the effect of changes due to barometric pressure, engine temperature, and any other stationary changes (sensor failures, etc.) which influence the engine torque curve more than 10%. This map is only valid for maximum boost pressure. At low boost pressures the torque limit may be much lower.

The engine configuration message must be sent at any time that the engine configuration map has changed by more than 10% of speed or torque (due to events other than boost pressure) since that last time the message was transmitted. As an alternative, it may be sent periodically, once every 5 s. It shall also be sent on response to a configuration request message.

The engine characteristic can be described in one of three modes. Mode 1 provides a complete curve of speed and torque points (see PGN65251\_A). Modes 2 and 3 provide a partial curve of speed and torque points and a separate endspeed governor characteristic. In modes 2 and 3, the receiver of the engine configuration message has to calculate the minimum of the engine torque curve and the endspeed governor characteristic to get the final available engine torque.

Mode 2 provides a high idle point where torque equals zero (point 6) and the endspeed governor gain Kp (see Figure PGN65251\_B). Mode 3 provides the kick-in point of the endspeed governor (point 2) and the governor gain Kp (see Figure PGN65251\_C).

The selection of the three modes can be done by setting the parameters as shown in 'Table PGN65251\_A.

Grandfathered definition for systems that implemented this message prior to July, 2010: On change of torque/speed points of more than 10% since last transmission. Alternative: Every 5 s.

|                               |                                                                                                                         |                                                        |  |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|--|
| Transmission Repetition Rate: | Every 5 s and on change of torque/speed points of more than 10% since last transmission but no faster than every 500 ms |                                                        |  |
| Data Length:                  | 39                                                                                                                      |                                                        |  |
| Extended Data Page:           | 0                                                                                                                       |                                                        |  |
| Data Page:                    | 0                                                                                                                       |                                                        |  |
| PDU Format:                   | 254                                                                                                                     |                                                        |  |
| PDU Specific:                 | 227                                                                                                                     | PGN Supporting Information: See Appendix D - PGN 65251 |  |
| Default Priority:             | 6                                                                                                                       |                                                        |  |
| Parameter Group Number:       | 65251 (0x00FEE3)                                                                                                        |                                                        |  |

| Start Position | Length  | Parameter Name                                                           | SPN |
|----------------|---------|--------------------------------------------------------------------------|-----|
| 01-02          | 2 bytes | Engine Speed At Idle, Point 1 (Engine Configuration)                     | 188 |
| 03             | 1 byte  | Engine Percent Torque At Idle, Point 1 (Engine Configuration)            | 539 |
| 04-05          | 2 bytes | Engine Speed At Point 2 (Engine Configuration)                           | 528 |
| 06             | 1 byte  | Engine Percent Torque At Point 2 (Engine Configuration)                  | 540 |
| 07-08          | 2 bytes | Engine Speed At Point 3 (Engine Configuration)                           | 529 |
| 09             | 1 byte  | Engine Percent Torque At Point 3 (Engine Configuration)                  | 541 |
| 10-11          | 2 bytes | Engine Speed At Point 4 (Engine Configuration)                           | 530 |
| 12             | 1 byte  | Engine Percent Torque At Point 4 (Engine Configuration)                  | 542 |
| 13-14          | 2 bytes | Engine Speed At Point 5 (Engine Configuration)                           | 531 |
| 15             | 1 byte  | Engine Percent Torque At Point 5 (Engine Configuration)                  | 543 |
| 16-17          | 2 bytes | Engine Speed At High Idle, Point 6 (Engine Configuration)                | 532 |
| 18-19          | 2 bytes | Engine Gain (Kp) Of The Endspped Governor (Engine Configuration)         | 545 |
| 20-21          | 2 bytes | Engine Reference Torque (Engine Configuration)                           | 544 |
| 22-23          | 2 bytes | Engine Maximum Momentary Override Speed, Point 7 (Engine Configuration)  | 533 |
| 24             | 1 byte  | Engine Maximum Momentary Override Time Limit (Engine Configuration)      | 534 |
| 25             | 1 byte  | Engine Requested Speed Control Range Lower Limit (Engine Configuration)  | 535 |
| 26             | 1 byte  | Engine Requested Speed Control Range Upper Limit (Engine Configuration)  | 536 |
| 27             | 1 byte  | Engine Requested Torque Control Range Lower Limit (Engine Configuration) | 537 |

|       |         |                                                                                        |      |
|-------|---------|----------------------------------------------------------------------------------------|------|
| 28    | 1 byte  | Engine Requested Torque Control Range Upper Limit (Engine Configuration)               | 538  |
| 29-30 | 2 bytes | Engine Extended Range Requested Speed Control Range Upper Limit (Engine configuration) | 1712 |
| 31-32 | 2 bytes | Engine Moment of Inertia                                                               | 1794 |
| 33-34 | 2 bytes | Engine Default Torque Limit                                                            | 1846 |
| 35    | 8 bits  | Support Variable Rate TSC1 Message                                                     | 3344 |
| 36    | 8 bits  | Support TSC1 Control Purpose Group 1                                                   | 3345 |
| 37    | 8 bits  | Support TSC1 Control Purpose Group 2                                                   | 3346 |
| 38    | 8 bits  | Support TSC1 Control Purpose Group 3                                                   | 3347 |
| 39    | 8 bits  | Support TSC1 Control Purpose Group 4                                                   | 3348 |

**(R) PGN 65252 Shutdown****SHUTDN**

Transmission Repetition Rate: 1 s  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 228 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 65252 (0x00FEE4)

| Start Position | Length | Parameter Name                                | SPN  |
|----------------|--------|-----------------------------------------------|------|
| 1.1            | 2 bits | Engine Idle Shutdown has Shutdown Engine      | 593  |
| 1.3            | 2 bits | Engine Idle Shutdown Driver Alert Mode        | 594  |
| 1.5            | 2 bits | Engine Idle Shutdown Timer Override           | 592  |
| 1.7            | 2 bits | Engine Idle Shutdown Timer State              | 590  |
| 2.7            | 2 bits | Engine Idle Shutdown Timer Function           | 591  |
| 3.1            | 2 bits | A/C High Pressure Fan Switch                  | 985  |
| 3.3            | 2 bits | Refrigerant Low Pressure Switch               | 875  |
| 3.5            | 2 bits | Refrigerant High Pressure Switch              | 605  |
| 4.1            | 2 bits | Engine Wait to Start Lamp                     | 1081 |
| 5.1            | 2 bits | Engine Protection System has Shutdown Engine  | 1110 |
| 5.3            | 2 bits | Engine Protection System Approaching Shutdown | 1109 |
| 5.5            | 2 bits | Engine Protection System Timer Override       | 1108 |
| 5.7            | 2 bits | Engine Protection System Timer State          | 1107 |
| 6.7            | 2 bits | Engine Protection System Configuration        | 1111 |
| 7.1            | 2 bits | Engine Alarm Acknowledge                      | 2815 |
| 7.3            | 2 bits | Engine Alarm Output Command Status            | 2814 |
| 7.5            | 2 bits | Engine Air Shutoff Command Status             | 2813 |
| 7.7            | 2 bits | Engine Overspeed Test                         | 2812 |
| 8.1            | 2 bits | Engine Air Shutoff Status                     | 3667 |
| 8.3            | 2 bits | PTO Shutdown has Shutdown Engine              | 5404 |

**PGN 65253****Engine Hours, Revolutions****HOURS**

Transmission Repetition Rate: On request  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 229 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 65253 (0x00FEE5)

| Start Position | Length  | Parameter Name                  | SPN |
|----------------|---------|---------------------------------|-----|
| 1-4            | 4 bytes | Engine Total Hours of Operation | 247 |
| 5-8            | 4 bytes | Engine Total Revolutions        | 249 |

**PGN 65254****Time/Date****TD**

Transmission Repetition Rate: On request  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 230 PGN Supporting Information: See Appendix D - PGN 65254  
 Default Priority: 6  
 Parameter Group Number: 65254 (0x00FEE6)

| Start Position | Length | Parameter Name      | SPN  |
|----------------|--------|---------------------|------|
| 1              | 1 byte | Seconds             | 959  |
| 2              | 1 byte | Minutes             | 960  |
| 3              | 1 byte | Hours               | 961  |
| 4              | 1 byte | Month               | 963  |
| 5              | 1 byte | Day                 | 962  |
| 6              | 1 byte | Year                | 964  |
| 7              | 1 byte | Local minute offset | 1601 |
| 8              | 1 byte | Local hour offset   | 1602 |

**PGN 65255****Vehicle Hours****VH**

Transmission Repetition Rate: On request  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 231 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 65255 (0x00FEE7)

| Start Position | Length  | Parameter Name            | SPN |
|----------------|---------|---------------------------|-----|
| 1-4            | 4 bytes | Total Vehicle Hours       | 246 |
| 5-8            | 4 bytes | Total Power Takeoff Hours | 248 |



**PGN 65256****Vehicle Direction/Speed****VDS**

Transmission Repetition Rate: On request  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 232 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 65256 (0x00FEE8)

| Start Position | Length  | Parameter Name                 | SPN |
|----------------|---------|--------------------------------|-----|
| 1-2            | 2 bytes | Compass Bearing                | 165 |
| 3-4            | 2 bytes | Navigation-Based Vehicle Speed | 517 |
| 5-6            | 2 bytes | Pitch                          | 583 |
| 7-8            | 2 bytes | Altitude                       | 580 |

**(R) PGN 65257 Fuel Consumption (Liquid)****LFC**

Engine fuel consumption accumulators. See PGN 64777 for alternate resolution.

Transmission Repetition Rate: On request  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 233 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 65257 (0x00FEE9)

| Start Position | Length  | Parameter Name         | SPN |
|----------------|---------|------------------------|-----|
| 1-4            | 4 bytes | Engine Trip Fuel       | 182 |
| 5-8            | 4 bytes | Engine Total Fuel Used | 250 |

**PGN 65258****Vehicle Weight****VW**

NOTE—Request has to be responded to with as many messages as necessary to transmit all available information.

Transmission Repetition Rate: On request  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 234 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 65258 (0x00FEEA)

| Start Position | Length  | Parameter Name | SPN |
|----------------|---------|----------------|-----|
| 1              | 8 bits  | Axle Location  | 928 |
| 2-3            | 2 bytes | Axle Weight    | 582 |
| 4-5            | 2 bytes | Trailer Weight | 180 |
| 6-7            | 2 bytes | Cargo Weight   | 181 |

**PGN 65259 Component Identification****CI**

NOTE - The make, model, serial number and unit number fields in this message are optional and separated by an ASCII "\*" . It is not necessary to include all fields; however, the delimiter ("\*") is always required.

Field:

a Make

Delimiter (ASCII "\*")

b Model

Delimiter (ASCII "\*")

c Serial number

Delimiter (ASCII "\*")

d Unit number (Power unit)

Delimiter (ASCII "\*")

These examples are permitted uses:

aaaaa\*b...b\*c...c\*d...d\*

\*b...b\*\*\*

\*b...b\*\*d...d\*

|                               |                  |                             |
|-------------------------------|------------------|-----------------------------|
| Transmission Repetition Rate: | On request       |                             |
| Data Length:                  | Variable         |                             |
| Extended Data Page:           | 0                |                             |
| Data Page:                    | 0                |                             |
| PDU Format:                   | 254              |                             |
| PDU Specific:                 | 235              | PGN Supporting Information: |
| Default Priority:             | 6                |                             |
| Parameter Group Number:       | 65259 (0x00FEEB) |                             |

| Start Position | Length                                                  | Parameter Name           | SPN |
|----------------|---------------------------------------------------------|--------------------------|-----|
| a              | Variable - up to 5 bytes followed by an "*" delimiter   | Make                     | 586 |
| b              | Variable - up to 200 bytes followed by an "*" delimiter | Model                    | 587 |
| c              | Variable - up to 200 bytes followed by an "*" delimiter | Serial Number            | 588 |
| d              | Variable - up to 200 bytes followed by an "*" delimiter | Unit Number (Power Unit) | 233 |

**PGN 65260 Vehicle Identification****VI**

Byte: 1-n Vehicle Identification Number  
 Delimiter (ASCII "\*\*")

Transmission Repetition Rate: On request  
 Data Length: Variable  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 236 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 65260 (0x00FEEC)

| Start Position | Length                                                   | Parameter Name                | SPN |
|----------------|----------------------------------------------------------|-------------------------------|-----|
| 1              | Variable - up to 200 bytes followed by an "**" delimiter | Vehicle Identification Number | 237 |

**PGN 65261 Cruise Control/Vehicle Speed Setup****CCSS**

Transmission Repetition Rate: On request  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 237 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 65261 (0x00FEED)

| Start Position | Length | Parameter Name                      | SPN |
|----------------|--------|-------------------------------------|-----|
| 1              | 1 byte | Maximum Vehicle Speed Limit         | 74  |
| 2              | 1 byte | Cruise Control High Set Limit Speed | 87  |
| 3              | 1 byte | Cruise Control Low Set Limit Speed  | 88  |

**PGN 65262 Engine Temperature 1****ET1**

Transmission Repetition Rate: 1 s  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 238 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 65262 (0x00FEEE)

| Start Position | Length  | Parameter Name                        | SPN  |
|----------------|---------|---------------------------------------|------|
| 1              | 1 byte  | Engine Coolant Temperature            | 110  |
| 2              | 1 byte  | Engine Fuel Temperature 1             | 174  |
| 3-4            | 2 bytes | Engine Oil Temperature 1              | 175  |
| 5-6            | 2 bytes | Engine Turbocharger Oil Temperature   | 176  |
| 7              | 1 byte  | Engine Intercooler Temperature        | 52   |
| 8              | 1 byte  | Engine Intercooler Thermostat Opening | 1134 |

**PGN 65263****Engine Fluid Level/Pressure 1****EFL/P1**

Transmission Repetition Rate: 0.5 s  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 239 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 65263 (0x00FEEF)

| Start Position | Length  | Parameter Name                             | SPN |
|----------------|---------|--------------------------------------------|-----|
| 1              | 1 byte  | Engine Fuel Delivery Pressure              | 94  |
| 2              | 1 byte  | Engine Extended Crankcase Blow-by Pressure | 22  |
| 3              | 1 byte  | Engine Oil Level                           | 98  |
| 4              | 1 byte  | Engine Oil Pressure                        | 100 |
| 5-6            | 2 bytes | Engine Crankcase Pressure                  | 101 |
| 7              | 1 byte  | Engine Coolant Pressure                    | 109 |
| 8              | 1 byte  | Engine Coolant Level                       | 111 |

**PGN 65264****Power Takeoff Information****PTO**

Transmission Repetition Rate: 100 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 240 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 65264 (0x00FEF0)

| Start Position | Length  | Parameter Name                                                | SPN  |
|----------------|---------|---------------------------------------------------------------|------|
| 1              | 1 byte  | Power Takeoff Oil Temperature                                 | 90   |
| 2-3            | 2 bytes | Power Takeoff Speed                                           | 186  |
| 4-5            | 2 bytes | Power Takeoff Set Speed                                       | 187  |
| 6.1            | 2 bits  | Engine PTO Governor Enable Switch                             | 980  |
| 6.3            | 2 bits  | Engine Remote PTO Governor Preprogrammed Speed Control Switch | 979  |
| 6.5            | 2 bits  | Engine Remote PTO Governor Variable Speed Control Switch      | 978  |
| 7.1            | 2 bits  | Engine PTO Governor Set Switch                                | 984  |
| 7.3            | 2 bits  | Engine PTO Governor Coast/Decelerate Switch                   | 983  |
| 7.5            | 2 bits  | Engine PTO Governor Resume Switch                             | 982  |
| 7.7            | 2 bits  | Engine PTO Governor Accelerate Switch                         | 981  |
| 8.1            | 2 bits  | Operator Engine PTO Governor Memory Select Switch             | 2897 |
| 8.3            | 2 bits  | Remote PTO Governor Preprogrammed Speed Control Switch #2     | 3447 |
| 8.5            | 2 bits  | Auxiliary Input Ignore Switch                                 | 3448 |

**PGN 65265 Cruise Control/Vehicle Speed****CCVS**

Transmission Repetition Rate: 100 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 241 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 65265 (0x00FEF1)

| Start Position | Length  | Parameter Name                           | SPN  |
|----------------|---------|------------------------------------------|------|
| 1.1            | 2 bits  | Two Speed Axle Switch                    | 69   |
| 1.3            | 2 bits  | Parking Brake Switch                     | 70   |
| 1.5            | 2 bits  | Cruise Control Pause Switch              | 1633 |
| 1.7            | 2 bits  | Park Brake Release Inhibit Request       | 3807 |
| 2-3            | 2 bytes | Wheel-Based Vehicle Speed                | 84   |
| 4.1            | 2 bits  | Cruise Control Active                    | 595  |
| 4.3            | 2 bits  | Cruise Control Enable Switch             | 596  |
| 4.5            | 2 bits  | Brake Switch                             | 597  |
| 4.7            | 2 bits  | Clutch Switch                            | 598  |
| 5.1            | 2 bits  | Cruise Control Set Switch                | 599  |
| 5.3            | 2 bits  | Cruise Control Coast (Decelerate) Switch | 600  |
| 5.5            | 2 bits  | Cruise Control Resume Switch             | 601  |
| 5.7            | 2 bits  | Cruise Control Accelerate Switch         | 602  |
| 6              | 1 byte  | Cruise Control Set Speed                 | 86   |
| 7.1            | 5 bits  | PTO Governor State                       | 976  |
| 7.6            | 3 bits  | Cruise Control States                    | 527  |
| 8.1            | 2 bits  | Engine Idle Increment Switch             | 968  |
| 8.3            | 2 bits  | Engine Idle Decrement Switch             | 967  |
| 8.5            | 2 bits  | Engine Test Mode Switch                  | 966  |
| 8.7            | 2 bits  | Engine Shutdown Override Switch          | 1237 |

**PGN 65266 Fuel Economy (Liquid)****LFE**

Transmission Repetition Rate: 100 ms  
 Data Length: 8  
 Extended Data Page: 0  
 Data Page: 0  
 PDU Format: 254  
 PDU Specific: 242 PGN Supporting Information:  
 Default Priority: 6  
 Parameter Group Number: 65266 (0x00FEF2)

| Start Position | Length  | Parameter Name                    | SPN  |
|----------------|---------|-----------------------------------|------|
| 1-2            | 2 bytes | Engine Fuel Rate                  | 183  |
| 3-4            | 2 bytes | Engine Instantaneous Fuel Economy | 184  |
| 5-6            | 2 bytes | Engine Average Fuel Economy       | 185  |
| 7              | 1 byte  | Engine Throttle Valve 1 Position  | 51   |
| 8              | 1 byte  | Engine Throttle Valve 2 Position  | 3673 |

**PGN 65267****Vehicle Position****VP**

Transmission Repetition Rate: 5 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 243 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 65267 (0x00FEF3)

| Start Position | Length  | Parameter Name | SPN |
|----------------|---------|----------------|-----|
| 1-4            | 4 bytes | Latitude       | 584 |
| 5-8            | 4 bytes | Longitude      | 585 |

**PGN 65268****Tire Condition****TIRE**

## Tire Condition Message

NOTE—Message has to be repeated as necessary to transmit all available information. This method of location identification requires individual SPNs to be assigned to report failures specific to each individual component (I.e. each tire, each axle, etc.).

Transmission Repetition Rate: 10 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 244 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 65268 (0x00FEF4)

| Start Position | Length  | Parameter Name                    | SPN  |
|----------------|---------|-----------------------------------|------|
| 1              | 8 bits  | Tire Location                     | 929  |
| 2              | 1 byte  | Tire Pressure                     | 241  |
| 3-4            | 2 bytes | Tire Temperature                  | 242  |
| 5.1            | 2 bits  | CTI Wheel Sensor Status           | 1699 |
| 5.3            | 2 bits  | CTI Tire Status                   | 1698 |
| 5.5            | 2 bits  | CTI Wheel End Electrical Fault    | 1697 |
| 6-7            | 2 bytes | Tire Air Leakage Rate             | 2586 |
| 8.6            | 3 bits  | Tire Pressure Threshold Detection | 2587 |

**PGN 65269      Ambient Conditions****AMB**

Transmission Repetition Rate: 1 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 245      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 65269 (0x00FEF5)

| Start Position | Length  | Parameter Name                | SPN |
|----------------|---------|-------------------------------|-----|
| 1              | 1 byte  | Barometric Pressure           | 108 |
| 2-3            | 2 bytes | Cab Interior Temperature      | 170 |
| 4-5            | 2 bytes | Ambient Air Temperature       | 171 |
| 6              | 1 byte  | Engine Air Intake Temperature | 172 |
| 7-8            | 2 bytes | Road Surface Temperature      | 79  |

**PGN 65270      Intake/Exhaust Conditions 1****IC1**

Transmission Repetition Rate: 0.5 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 246      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 65270 (0x00FEF6)

| Start Position | Length  | Parameter Name                                   | SPN |
|----------------|---------|--------------------------------------------------|-----|
| 1              | 1 byte  | Engine Diesel Particulate Filter Intake Pressure | 81  |
| 2              | 1 byte  | Engine Intake Manifold #1 Pressure               | 102 |
| 3              | 1 byte  | Engine Intake Manifold 1 Temperature             | 105 |
| 4              | 1 byte  | Engine Air Intake Pressure                       | 106 |
| 5              | 1 byte  | Engine Air Filter 1 Differential Pressure        | 107 |
| 6-7            | 2 bytes | Engine Exhaust Gas Temperature                   | 173 |
| 8              | 1 byte  | Engine Coolant Filter Differential Pressure      | 112 |

**PGN 65271      Vehicle Electrical Power 1****VEP1**

Transmission Repetition Rate: 1 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 247      PGN Supporting Information: See Appendix D - PGN 65104  
Default Priority: 6  
Parameter Group Number: 65271 (0x00FEF7)

| Start Position | Length  | Parameter Name                      | SPN |
|----------------|---------|-------------------------------------|-----|
| 1              | 1 byte  | Net Battery Current                 | 114 |
| 2              | 1 byte  | Alternator Current                  | 115 |
| 3-4            | 2 bytes | Charging System Potential (Voltage) | 167 |
| 5-6            | 2 bytes | Battery Potential / Power Input 1   | 168 |
| 7-8            | 2 bytes | Keyswitch Battery Potential         | 158 |

**PGN 65272      Transmission Fluids 1****TRF1**

Transmission Repetition Rate: 1 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 248      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 65272 (0x00FEF8)

| Start Position | Length  | Parameter Name                            | SPN  |
|----------------|---------|-------------------------------------------|------|
| 1              | 1 byte  | Clutch Pressure                           | 123  |
| 2              | 1 byte  | Transmission Oil Level                    | 124  |
| 3              | 1 byte  | Transmission Filter Differential Pressure | 126  |
| 4              | 1 byte  | Transmission Oil Pressure                 | 127  |
| 5-6            | 2 bytes | Transmission Oil Temperature              | 177  |
| 7              | 1 bytes | Transmission Oil Level High / Low         | 3027 |
| 8.1            | 4 bits  | Transmission Oil Level Countdown Timer    | 3028 |
| 8.5            | 4 bits  | Transmission Oil Level Measurement Status | 3026 |



**PGN 65273      Axle Information****AI**

Axle information message

NOTE—Message must be repeated as necessary to transmit all available information. This method of location identification requires individual SPNs to be assigned to report failures specific to each individual component (i.e. each tire, each axle, etc.).

Transmission Repetition Rate: 1 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 249      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 65273 (0x00FEF9)

| Start Position | Length | Parameter Name               | SPN  |
|----------------|--------|------------------------------|------|
| 1              | 1 byte | Steering Axle Temperature    | 75   |
| 2              | 8 bits | Drive Axle Location          | 930  |
| 3              | 1 byte | Drive Axle Lift Air Pressure | 579  |
| 4              | 1 byte | Drive Axle Temperature       | 578  |
| 5              | 1 byte | Drive Axle Lube Pressure     | 2613 |
| 8              | 1 byte | Steering Axle Lube Pressure  | 2614 |

**PGN 65274      Brakes****B**

Transmission Repetition Rate: 1 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 250      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 65274 (0x00FEFA)

| Start Position | Length | Parameter Name                    | SPN  |
|----------------|--------|-----------------------------------|------|
| 1              | 1 byte | Brake Application Pressure        | 116  |
| 2              | 1 byte | Brake Primary Pressure            | 117  |
| 3              | 1 byte | Brake Secondary Pressure          | 118  |
| 4.1            | 2 bits | Parking Brake Actuator            | 619  |
| 4.3            | 2 bits | Parking Brake Red Warning Signal  | 3557 |
| 4.5            | 2 bits | Park Brake Release Inhibit Status | 3808 |

**(R) PGN 65275 Retarder fluids****RF**

Transmission Repetition Rate: 1 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 251 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 65275 (0x00FEFB)

| Start Position | Length | Parameter Name                        | SPN  |
|----------------|--------|---------------------------------------|------|
| 1              | 1 byte | Hydraulic Retarder Pressure           | 119  |
| 2              | 1 byte | Hydraulic Retarder Oil Temperature    | 120  |
| 3.1            | 2 bits | Driveline Retarder Overheat Indicator | 5346 |

**PGN 65276 Dash Display****DD**

Transmission Repetition Rate: 1s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 252 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 65276 (0x00FEFC)

| Start Position | Length  | Parameter Name                           | SPN |
|----------------|---------|------------------------------------------|-----|
| 1              | 1 byte  | Washer Fluid Level                       | 80  |
| 2              | 1 byte  | Fuel Level 1                             | 96  |
| 3              | 1 byte  | Engine Fuel Filter Differential Pressure | 95  |
| 4              | 1 byte  | Engine Oil Filter Differential Pressure  | 99  |
| 5-6            | 2 bytes | Cargo Ambient Temperature                | 169 |
| 7              | 1 byte  | Fuel Level 2                             | 38  |

**PGN 65277 Alternate Fuel 1****A1**

Transmission Repetition Rate: 500 ms  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 253 PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 65277 (0x00FEFD)

| Start Position | Length  | Parameter Name                      | SPN |
|----------------|---------|-------------------------------------|-----|
| 1              | 1 byte  | Engine Blower Bypass Valve Position | 72  |
| 2-3            | 2 bytes | Engine Gas Supply Pressure          | 159 |

**PGN 65278      Auxiliary Water Pump Pressure****AWPP**

Transmission Repetition Rate: 1 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 254      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 65278 (0x00FEFE)

| Start Position | Length | Parameter Name          | SPN |
|----------------|--------|-------------------------|-----|
| 1              | 1 byte | Auxiliary Pump Pressure | 73  |

**PGN 65279      Water in Fuel Indicator****WFI**

Transmission Repetition Rate: 10 s  
Data Length: 8  
Extended Data Page: 0  
Data Page: 0  
PDU Format: 254  
PDU Specific: 255      PGN Supporting Information:  
Default Priority: 6  
Parameter Group Number: 65279 (0x00FEFF)

| Start Position | Length | Parameter Name          | SPN |
|----------------|--------|-------------------------|-----|
| 1.1            | 2 bits | Water In Fuel Indicator | 97  |

## APPENDIX D SUPPORTING INFORMATION

### SPN 16 – Fuel Filter (Suction Side) Differential Pressure

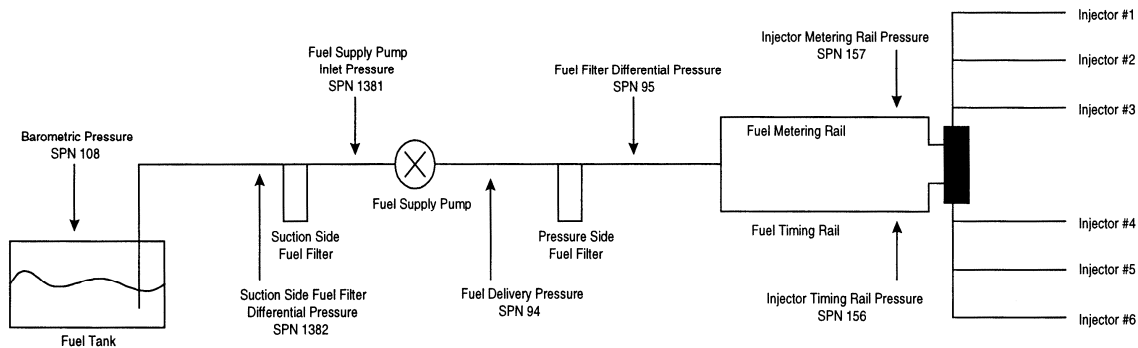


FIGURE SPN16\_A - FUEL SYSTEM WITH RAILS

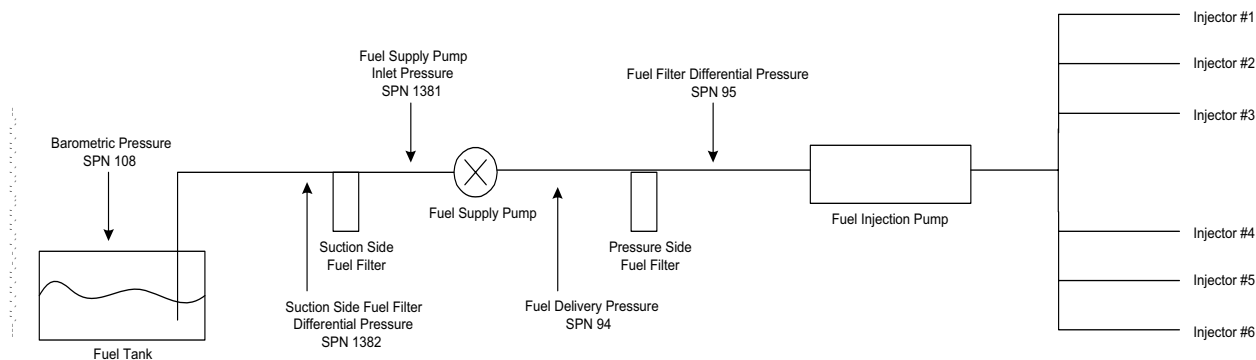


FIGURE SPN16\_B - FUEL SYSTEM WITH PUMP

## (R) SPN 27 – EGR System Diagram

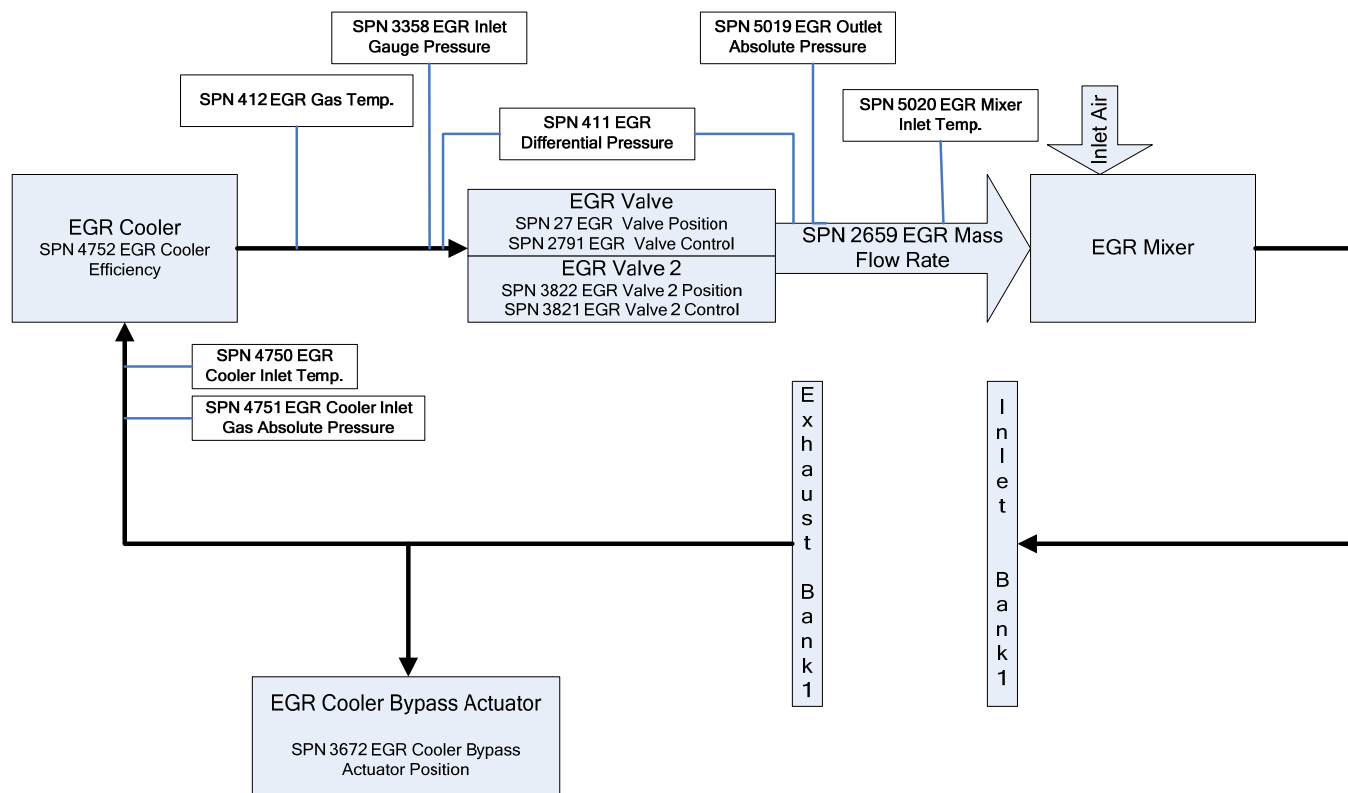


FIGURE SPN27\_A – EGR SYSTEM

## SPN 512 – Driver's Demand Engine – Percent Torque

Figure SPN512\_A and Figure SPN512\_B show two typical torque calculations in an engine controller. On the left side of the figures there are single engine controller functions. The output torque signals of these functions are connected in the manner shown. The result is the actual engine percent torque which is realized by the engine.

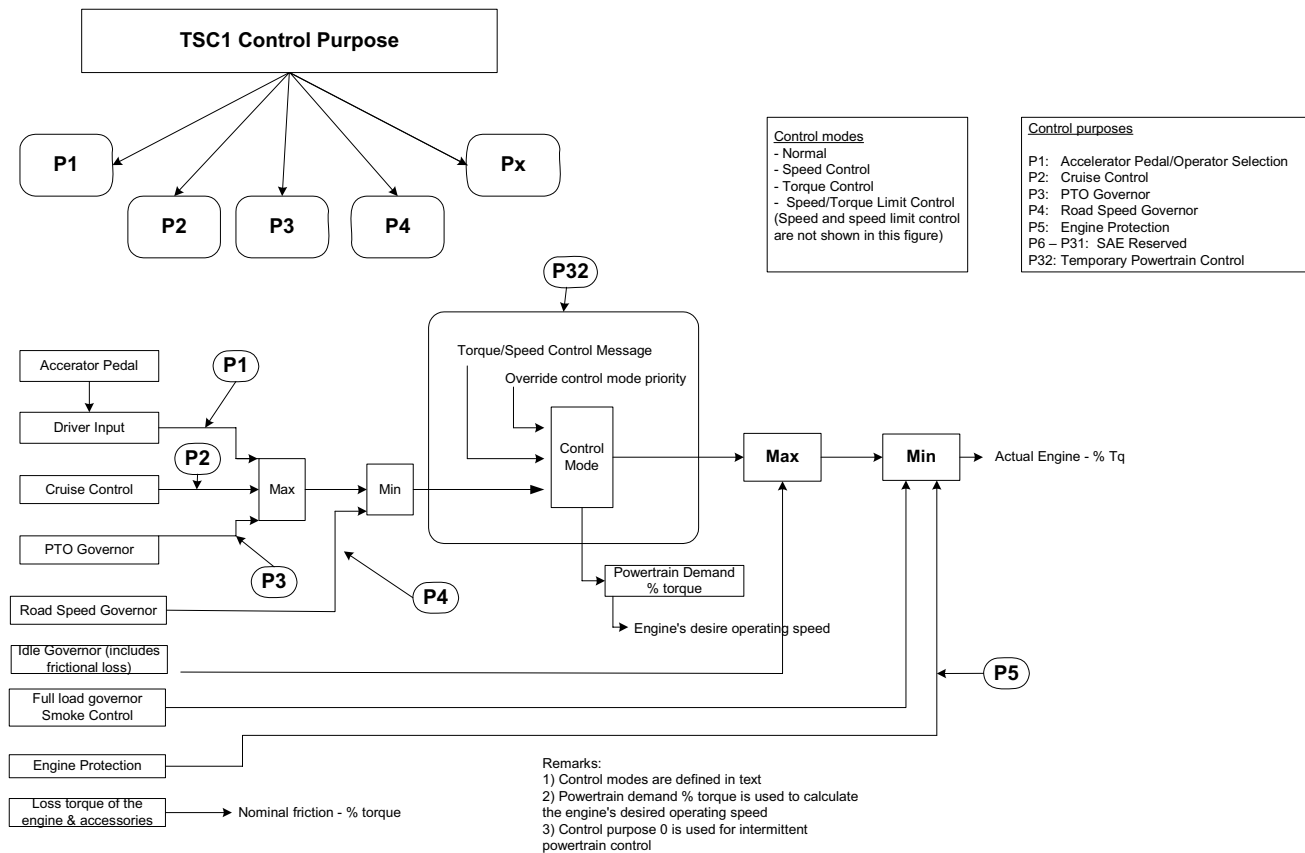


FIGURE SPN512\_A - TORQUE COMMANDS AND CALCULATIONS WHEN A "MAXIMUM SELECTION FOR LOW IDLE" TECHNIQUE IS USED

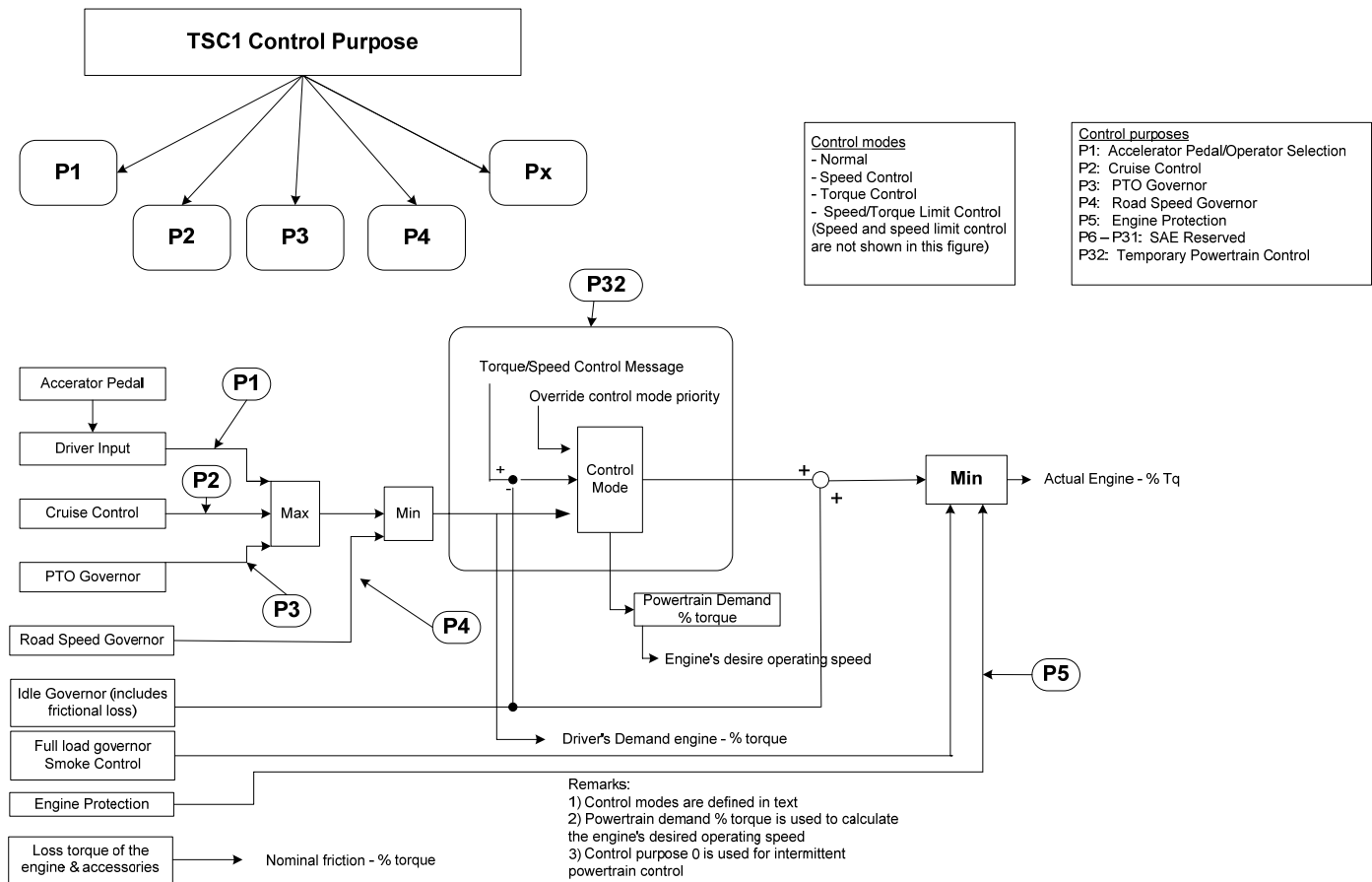


FIGURE SPN512\_B - TORQUE COMMANDS AND CALCULATIONS WHEN A “SUMMATION WITH LOW IDLE” TECHNIQUE IS USED

On top of the figures, external torque commands (e.g., traction and transmission control) can control the engine. These commands can influence the engine torque by four control modes. Four engine internal signals are transmitted to the network:

- Driver's demand engine - percent torque
- Actual engine - percent torque
- Nominal friction - percent torque
- Engine's desired operating speed

The difference between Figure SPN512\_A and Figure SPN512\_B is the connection of the idle governor output to the torque calculation. In Figure SPN512\_A there is a maximum selection, while in Figure SPN512\_B a summation is used. The summation method needs a subtraction point for each external command input because the starting point of an ASR or a shift operation should be the present actual engine - percent torque value. As the actual engine - percent torque signal contains the idle governor output and the external commands are compared with the driver's demand engine - percent torque or the powertrain demand which don't contain the idle governor output, the external commands must be subtracted by the idle governor output to get the correct signals for comparison.

The advantage of the maximum selection (Figure SPN512\_A) is that no other speed controller can work parallel to the idle governor. This allows for a better optimization of the different speed control loops. The advantage of the summation method (Figure SPN512\_B) is that changes of the idle governor output influence the engine directly (no dead zones exist).

## SPN 518 – Engine Requested Torque/Torque Limit

When preparing to send a request to a retarder, the states of the Retarder Enable - Shift Assist Switch and the Retarder Enable - Brake Assist Switch must be checked by the requesting device to determine whether the request may be sent to the Retarder. Figure SPN518\_A shows how those switches and other operator and network inputs are used to create the actual retarder operating point on a system-wide basis. The Retarder may or may not be the device reading the actual switches; even if it is, it will not accept or reject a request based on its knowledge of the switch states. Its function is to send the switch states via J1939 (in its ERC1 message) and it expects other J1939 nodes to honor those switch states by refraining from sending inappropriate commands.

Several elements affect the retarder besides the Requested Torque parameter in the TSC1 message. These elements are not looked at by the retarder itself, but are used by various other devices to determine if they may ask the retarder to be engaged. These are the Retarder Enable Shift Assist Switch, and the Retarder Enable Brake Assist Switch. The relationship between those switches and the retarder (as well as that between the operator and retarder) is described in Figure SPN518\_A.

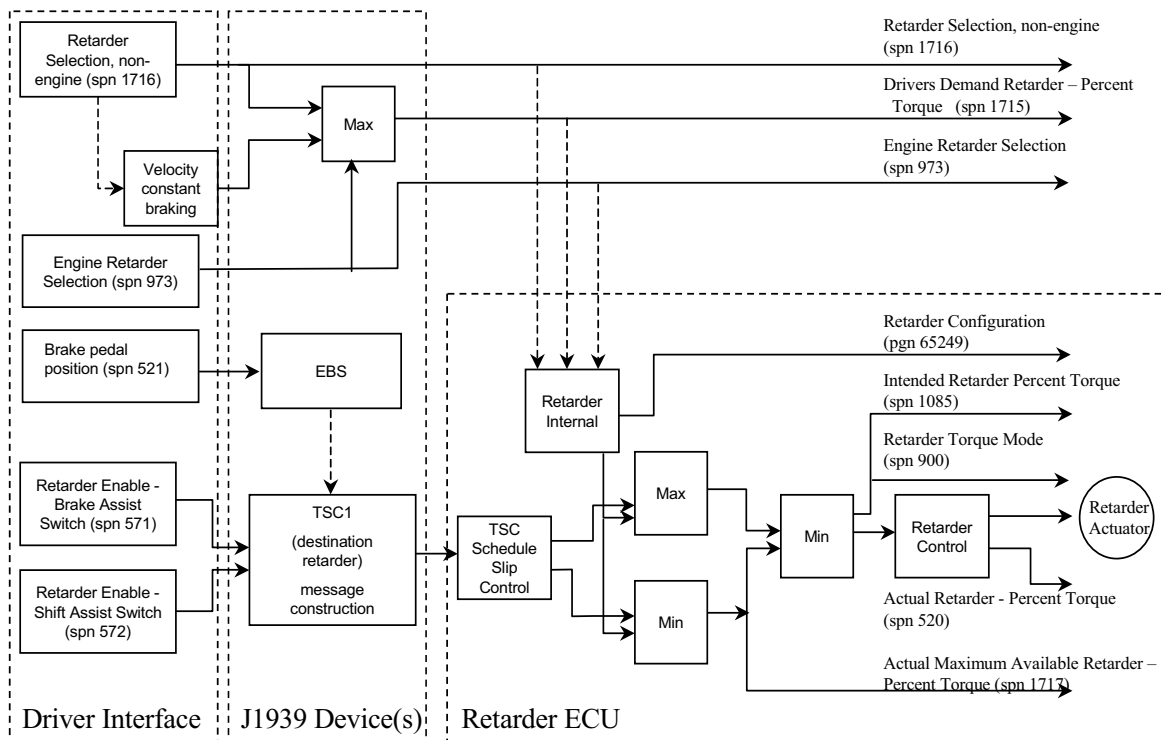


FIGURE SPN518\_A - RELATIONSHIP BETWEEN OPERATOR/SWITCH INPUTS AND RETARDERS



Tables SPN518\_A and SPN518\_B identify many use cases. Each row is the summary of one or more uses. One of the primary communications provided by these tables is that the retarder can be activated by the J1939 TSC1 message, although the operator input is "off."

**TABLE SPN518\_A—PRIMARY RETARDER – BEFORE TRANSMISSION**  
(Compression Release Engine Retarder)

| J1939<br>Inputs <sup>1</sup><br>(TSC1) | Operator Inputs                |                             |                                                                    | Outputs                                  |                                  |
|----------------------------------------|--------------------------------|-----------------------------|--------------------------------------------------------------------|------------------------------------------|----------------------------------|
|                                        | Cruise<br>Control <sup>2</sup> | Accel<br>Pedal <sup>3</sup> | Torque Request<br>Via "Retarder<br>Selection, Engine" <sup>4</sup> | May Retarder<br>Provide Brake<br>Torque? | Retarder Torque<br>Mode (base 2) |
| T                                      | Any                            | Any                         | Any                                                                | No                                       | 0000                             |
| R                                      | Any                            | Any                         | Any                                                                | Yes                                      | > 0001                           |
| NTR                                    | Any                            | T                           | Any                                                                | No                                       | 0000                             |
| NTR                                    | R                              | ZR                          | R                                                                  | Yes                                      | > 0001                           |
| NTR                                    | R                              | ZR                          | ZR                                                                 | Yes                                      | 0010                             |
| NTR                                    | NTR                            | ZR                          | R <sup>5</sup>                                                     | Yes <sup>5</sup>                         | 0001                             |
| NTR                                    | NTR                            | ZR                          | ZR                                                                 | No                                       | 0000                             |
| ZR                                     | Any                            | Any                         | Any                                                                | No                                       | 0000                             |

Key:

T = request positive Torque

R = request Retarder torque

NTR = No Torque Request

ZR = Zero torque Requested by retarder

Any = This value has no bearing whether or not the Retarder is available. The retarder will NOT be available because some other entity is requesting positive torque.

Footnotes:

1. Note that the TSC1 inputs will override Operator Torque Selection. The J1939 devices that generate the TSC1 messages will assure that the Retarder Enable Brake Assist Switch and Retarder Enable Shift Assist Switch are enabled as appropriate before commanding the Retarder to engage. See parameters SPN 571 and 572 for descriptions of these switches. Also, for the purposes of this table, it is assumed that if the TSC1, Destination Retarder message is requesting Retarder Torque, no other TSC1, Destination Engine messages are requesting engine fueling. That arbitration is beyond the scope of this section.
2. This refers to the torque requested by the cruise control, and does not refer to the cruise switches. Cruise control is defined to be on and engaged in this column. The cruise control should not request retarder torque unless the Retarder Enable - Brake Assist Switch is enabled.
3. The Accelerator Pedal is inherently incapable of requesting negative torque. It may have no particular torque demands, or it may request some engine fueling, which prevents the retarder from engaging. Consequently, the chart is complete even though no rows exist for the AP to request retarder torque.

4. The Operator Torque Request is incapable of requesting positive torque. The table is complete without the Operator Torque Request asking for positive Engine Torque
5. This description assumes no other switch (such as brake pedal depressed) is needed in order for the operator torque request to initiate retarder braking. Other implementation specific rules would apply if such a catalyst were needed.

Table SPN518\_B shows the relationship between various inputs and an after engine retarder.

The biggest difference between this type of retarder and an engine brake is that the exhaust brake may be engaged while the engine is still being fueled. Also, if cruise control is communicating with the retarder, it would do so using the TSC1 message.

Consequently, columns for accelerator pedal input and cruise control input would only serve to confuse the issue of retarder availability in Table SPN518\_B.

**TABLE SPN518\_B—PRIMARY RETARDER – AFTER ENGINE (EXHAUST BRAKE, HYDRAULIC RETARDER)**

| Operator Inputs                     |                                                               | Outputs                                  |                                  |
|-------------------------------------|---------------------------------------------------------------|------------------------------------------|----------------------------------|
| J1939 Inputs <sup>1</sup><br>(TSC1) | Torque Request<br>Via operator torque<br>request <sup>2</sup> | May Retarder<br>Provide Brake<br>Torque? | Retarder Torque<br>Mode (base 2) |
| R                                   | R                                                             | Yes                                      | > 0001                           |
| R                                   | ZR                                                            | Yes                                      | > 0001                           |
| NTR                                 | R <sup>3</sup>                                                | Yes <sup>3</sup>                         | 0001                             |
| NTR                                 | ZR                                                            | No                                       | 0000                             |
| ZR                                  | Any                                                           | No                                       | 0000                             |

Key:

R = request Retarder torque - some amount of braking torque is requested of the retarder.

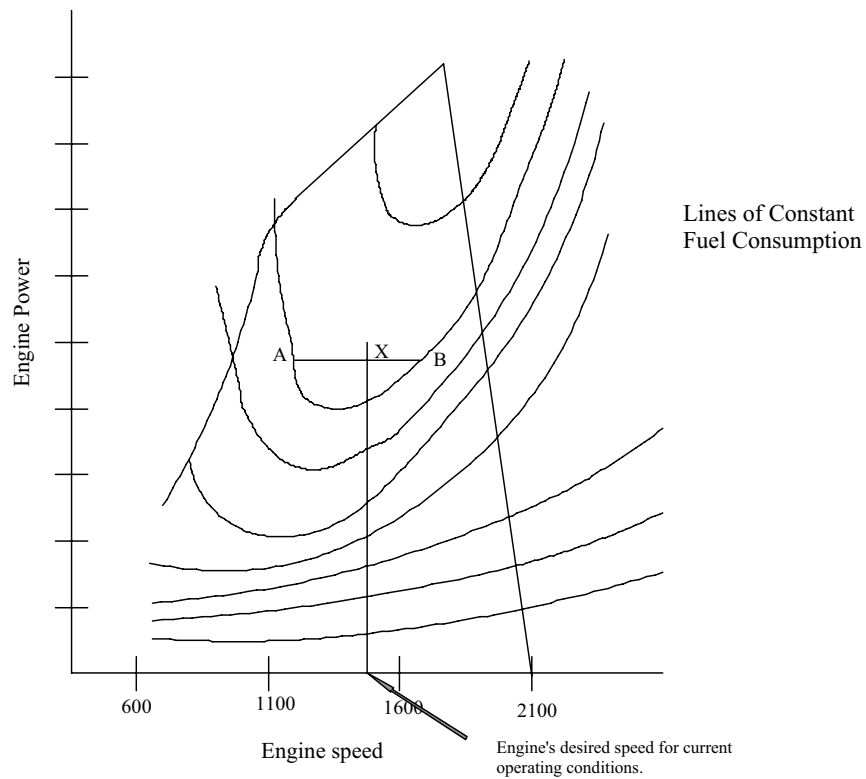
ZR = Zero Retarder request - Zero percent torque is requested of the retarder

NTR = No retarder Torque Request - No request is being made of the retarder one way or another.

Any = This value has no bearing whether or not the retarder is available. In fact, because of what some other entity is requesting, the retarder will NOT be available.

## Footnotes:

1. Note that the TSC1 inputs will override Operator Torque Selection. The J1939 devices that generate the TSC1 messages will assure that the Retarder Enable Brake Assist Switch and Retarder Enable Shift Assist Switch are enabled before commanding the Retarder to engage. Also, for the purposes of this table, it is assumed that if the TSC1, Destination Retarder message is requesting Retarder Torque, no other TSC1, Destination Engine messages are requesting engine fueling. That arbitration is beyond the scope of this section.
2. The Operator Torque Request is incapable of requesting positive torque. The table is complete without the Operator Torque Request asking for positive Engine Torque
3. This description assumes no other switch (such as brake pedal depressed) is needed in order for the operator torque request to initiate retarder braking. Other implementation specific rules would apply if such a requirement were needed.

**SPN 519 – Desired Operating Speed Asymmetry Adjustment****FIGURE SPN519\_A—DESIRED OPERATING SPEED ASYMMETRY ADJUSTMENT**

**SPN 527 – Cruise Control States****TABLE SPN527\_A —CRUISE CONTROL STATES**

| Bit States | Cruise Control State |
|------------|----------------------|
| 000        | Off/Disabled         |
| 001        | Hold                 |
| 010        | Accelerate           |
| 011        | Decelerate/Coast     |
| 100        | Resume               |
| 101        | Set                  |
| 110        | Accelerator override |
| 111        | Not available        |

**State Descriptions:**

000b Off/Disabled —Used to indicate that the cruise control device is off or on standby. Note that the cruise control system switch does not necessarily have to be off to be in this mode.

001b Hold —Used to indicate that the cruise control device is active and currently maintaining a captured operating speed.

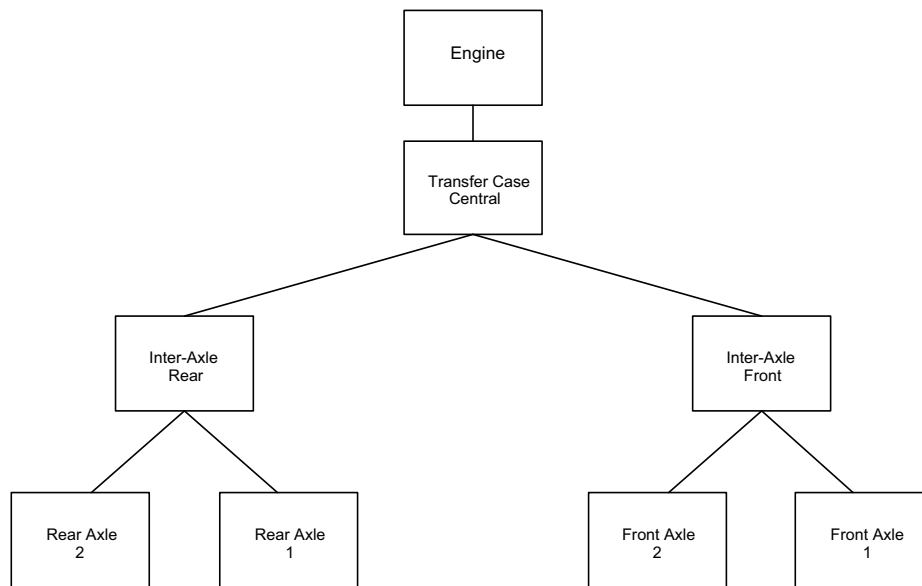
010b Accelerate —Used to indicate that the cruise control device is in the process of ramping up the operating speed.

011b Decelerate —Used to indicate that the cruise control device is in the process of ramping down, or coasting, the operating speed.

100b Resume —Used to indicate that the cruise control device is in the process of resuming the operating speed to a previously captured value.

101b Set —Used to indicate that the cruise control device is establishing the current vehicle speed as the operating speed (captured value).

110b Accelerator Override —Used to indicate that the cruise control device is active but not currently maintaining the captured operating speed.

**SPN 564 – Differential Lock Positions****FIGURE SPN564\_A—DIFFERENTIAL LOCK POSITIONS**

SPN 574 – Shift in Process

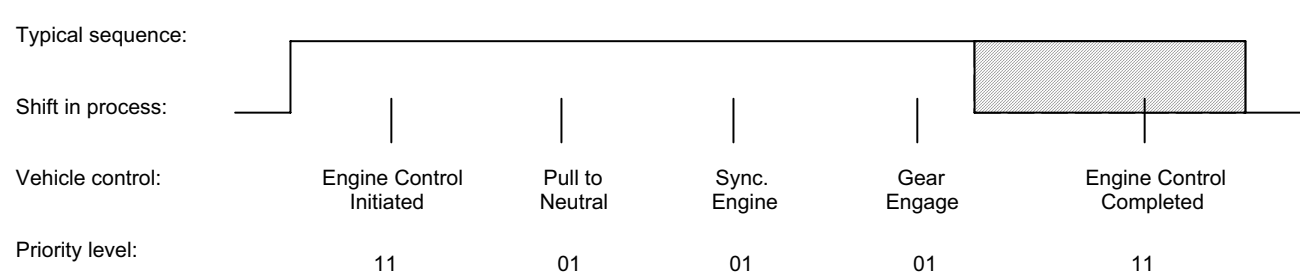


FIGURE SPN574\_A—SHIFT IN PROCESS

## SPN 590 – Idle Shutdown

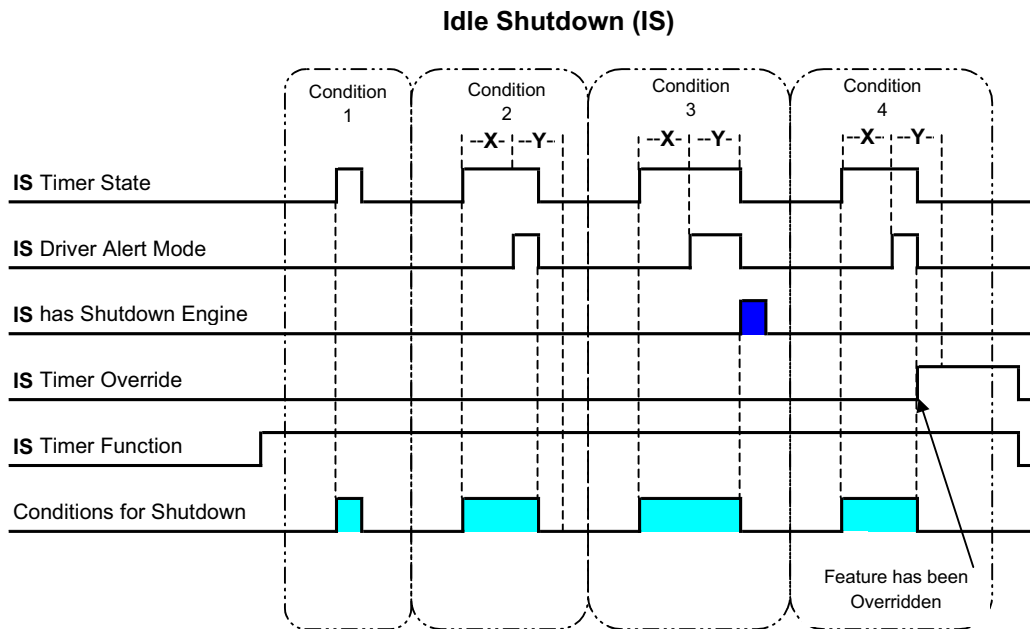


FIGURE SPN590\_A—IDLE SHUTDOWN (IS)

Condition 1 - When the IS Timer Override is inactive, the IS Timer State will become inactive if the conditions for shutdown no longer exist before the “X” time interval has expired or IS Driver Alert Mode is activated.

Condition 2 - When the IS Timer Override is inactive, the IS Timer State will become inactive if the conditions for shutdown no longer exist before the IS Driver Alert Mode “Y” time interval has expired.

Condition 3 - When the IS Timer Override is inactive, then the IS has Shutdown Engine will be active after the “Y” time interval has expired.

Condition 4 - When the IS Timer Override is active during the “Y” time interval, then the IS feature shall be overridden and will no longer be available until the system has been re-initiated.

NOTE —0 State – Inactive, disabled in calibration, or conditions for idle shutdown do not exist.

1 State – Active, enabled in calibration, or conditions for idle shutdown do exist.



## SPN 695 – Engine Override Control Mode

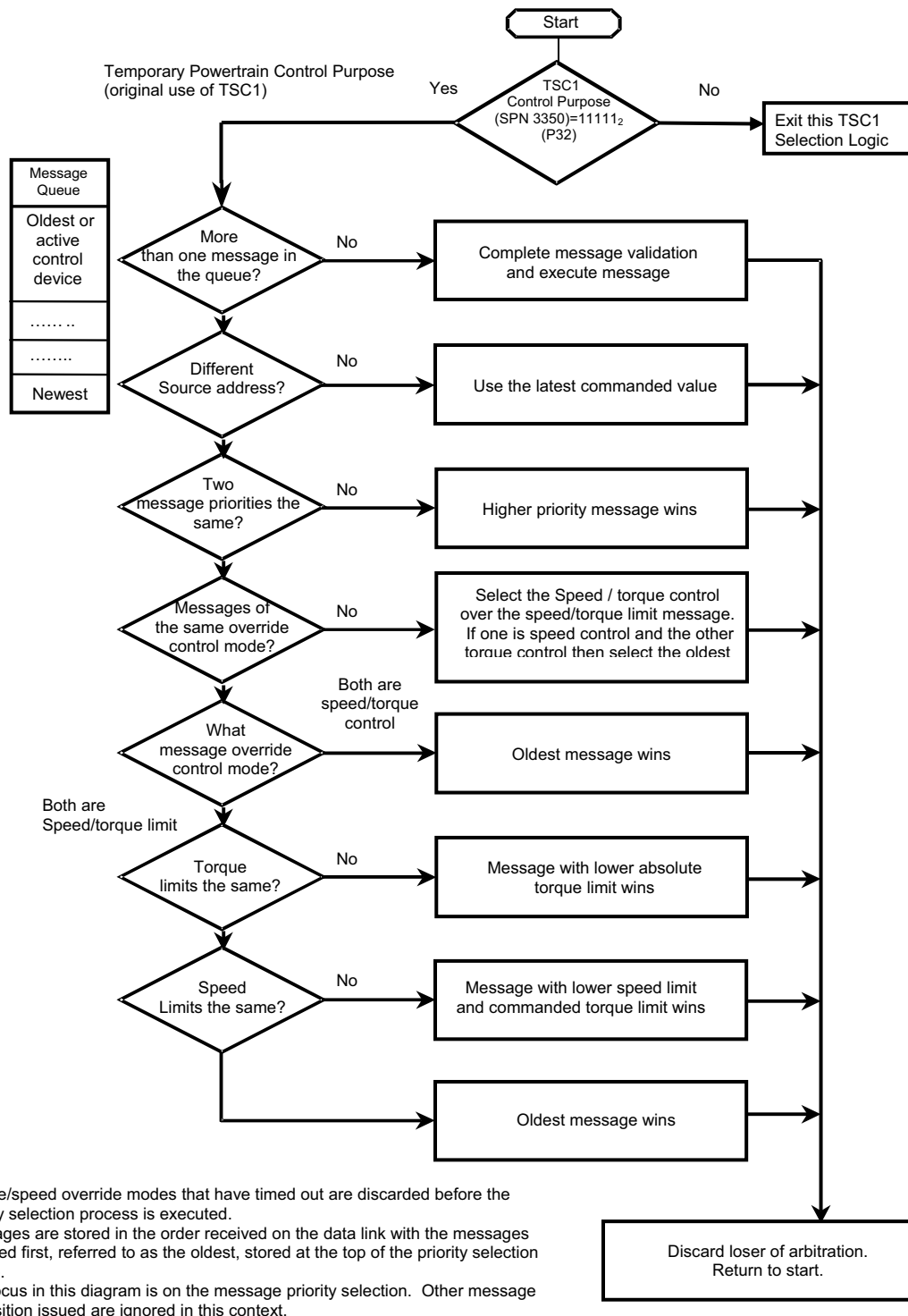


FIGURE SPN695\_A—TORQUE/SPEED CONTROL PRIORITY SELECTION LOGIC



**1011b Remote Accelerator** - This mode is active if the remote accelerator is controlling engine speed.

**1100b Service procedure** - This mode is active if the engine is operating in a specific service mode. For example, fuel injection may be disabled to allow a service procedure to crank the engine without fuel injection occurring.

**1110b Other** - Torque control by a type of device which is different than those defined in states 0000b to 1100b.

**SPN 901 – Retarder Type****TABLE SPN901\_A —RETARDER TYPES**

| Bit States | Retarder Type                         |
|------------|---------------------------------------|
| 0000       | Electric/Magnetic                     |
| 0001       | Hydraulic                             |
| 0010       | Cooled Friction                       |
| 0011       | Compression Release (Engine retarder) |
| 0100       | Exhaust                               |
| 0101-1101  | Not defined                           |
| 1110       | Other                                 |
| 1111       | Not available                         |

*Electric/Magnetic Retarder* - The electric/magnetic retarder functions by creating eddy currents generated in a conductive armature when placed in a variable magnetic field. Currently, electric retarders have a stator on which field coils are mounted. The rotors, mounted on both sides of the drive shaft, are ribbed for heat dissipation. In order to brake the vehicle, voltage is applied to the field coils which generate a magnetic field inducing eddy currents in the rotors as they pass through the field. Magnetic retarders use a permanent magnet to generate the eddy currents. Braking-torque is dependent on stator excitation and on the air gap between the rotor and the stator.

*Hydraulic Retarder* - The hydraulic retarder is a hydrodynamic coupling device. Two impellers which face each other, a rotor and a stator, are filled with oil. When the rotor, which is connected to the vehicle drive shaft rotates, it drives the oil in the direction of rotation. The mechanical energy produced by the rotor is converted into kinetic energy in the operating fluid. Hydrodynamic coupling between the rotor and stator converts the kinetic energy into heat and the rotor is retarded. This retardation effect is transmitted to the drive shaft and the vehicle is retarded.

*Cooled Friction Brake* - The cooled friction brake uses air or hydraulic fluid to dissipate heat from the friction surface of the service brake. By controlling the friction surface temperature, retarding torque is improved, along with a reduced rate of wear.

*Compression Release Engine Retarder* - The compression release engine retarder converts a power-producing diesel engine into a power-absorbing retarding mechanism by opening the exhaust valve near the top dead center in the engine compression cycle. No positive power will be produced, since the compressed air mass is released. The vehicle is retarded as it must provide energy to compress the cylinder air charge and subsequently to return the piston to the bottom position.

*Exhaust Brake* - The exhaust brake restricts the escape of the exhaust gas from the exhaust manifold. Each succeeding exhaust stroke builds up a back pressure in the manifold which exerts a retarding effect to the pistons during the exhaust stroke. The engine turns against this back pressure creating a braking effect to the vehicle.

*Auxiliary Retarder* - Fans, air conditioners, or any power-absorbing device in the vehicle can also function as retarders as they impose parasitic loading on the engine or vehicle.

## SPN 911 – Service Component Identification

TABLE SPN911\_A—SERVICE COMPONENT IDENTIFICATION

| Identification | Component                                  |
|----------------|--------------------------------------------|
| 0              | Service check for entire vehicle           |
| 1              | Brake lining; left front axle              |
| 2              | Brake lining; right front axle             |
| 3              | Brake lining; left rear axle               |
| 4              | Brake lining; right rear axle              |
| 5              | Clutch lining                              |
| 6-10           | Not defined                                |
| 11             | Brake lining; left rear axle #2            |
| 12             | Brake lining; right rear axle #2           |
| 13             | Brake lining; left rear axle #3            |
| 14             | Brake lining; right rear axle #3           |
| 15             | Brake lining: general                      |
| 16             | Regulated general check for entire vehicle |
| 17             | Brake system special check                 |
| 18             | In-between check                           |
| 19             | Check trip recorder                        |
| 20             | Check exhaust gas                          |
| 21             | Check vehicle speed limiter                |
| 22-29          | Not defined                                |
| 30             | Engine coolant change                      |
| 31             | Engine coolant filter change               |
| 32             | Engine oil—engine #1                       |
| 33             | Engine oil—engine #2                       |
| 34             | Not defined                                |
| 35             | Steering oil                               |
| 36             | Not defined                                |
| 37             | Transmission oil — transmission #1         |
| 38             | Transmission oil — transmission #2         |
| 39             | Transmission oil filter — transmission #1  |
| 40             | Intermediate transmission oil              |
| 41             | Not defined                                |
| 42             | Front axle oil                             |
| 43             | Rear axle oil                              |
| 44-47          | Not defined                                |
| 48             | Tires                                      |
| 49             | Engine air filter                          |
| 50             | Engine oil filter                          |
| 51             | Engine Fuel Filter                         |
| 52-60          | Not defined                                |
| 61             | Tachograph                                 |
| 62             | Driver card #1                             |
| 63             | Driver card #2                             |
| 64-239         | Not defined                                |
| 240-249        | Manufacturer specific                      |
| 250-251        | Reserved                                   |
| 252            | Reset all components                       |
| 253            | No action to be taken                      |
| 254            | Error                                      |
| 255            | Component identification not available     |

## SPN 988 – Trip Group 1

TABLE SPN988\_A—TRIP GROUP 1

| Parameter                                                            | SPN        |
|----------------------------------------------------------------------|------------|
| Trip distance                                                        | 244        |
| Trip fuel                                                            | 182        |
| High resolution trip distance                                        | 918        |
| Trip compression brake distance                                      | 990        |
| Trip service brake applications                                      | 993        |
| Trip maximum engine speed                                            | 1013       |
| Trip average engine speed                                            | 1014       |
| Trip drive average load factor                                       | 1015       |
| Trip average fuel rate                                               | 1029       |
| Trip average fuel rate (Gaseous)                                     | 1031       |
| Aftertreatment 1 Trip Fuel Used                                      | 3733       |
| Aftertreatment 1 Trip Active Regeneration Time                       | 3734       |
| Aftertreatment 1 Trip Disabled Time                                  | 3735       |
| Aftertreatment 1 Trip Number of Active Regenerations                 | 3736       |
| Aftertreatment 1 Trip Passive Regeneration Time                      | 3737       |
| Aftertreatment 1 Trip Number of Passive Regenerations                | 3738       |
| Aftertreatment 1 Trip Number of Active Regeneration Inhibit Requests | 3739       |
| Aftertreatment 1 Trip Number of Active Regeneration Manual Requests  | 3740       |
| Aftertreatment 2 Trip Fuel Used                                      | 3741       |
| Aftertreatment 2 Trip Active Regeneration Time                       | 3742       |
| Aftertreatment 2 Trip Disabled Time                                  | 3743       |
| Aftertreatment 2 Trip Number of Active Regenerations                 | 3744       |
| Aftertreatment 2 Trip Passive Regeneration Time                      | 3745       |
| Aftertreatment 2 Trip Number of Passive Regenerations                | 3746       |
| Aftertreatment 2 Trip Number of Active Regeneration Inhibit Requests | 3747       |
| Aftertreatment 2 Trip Number of Active Regeneration Manual Requests  | 3748       |
| <b>Parameter Group</b>                                               | <b>PGN</b> |
| Aftertreatment 2 Trip Information                                    | 64888      |
| Aftertreatment 1 Trip Information                                    | 64889      |
| Trip time information #2                                             | 65200      |
| Trip time information #1                                             | 65204      |
| Trip shutdown information                                            | 65205      |
| Trip vehicle speed/cruise distance information                       | 65206      |
| Trip fuel information (Gaseous)                                      | 65208      |
| Trip fuel information                                                | 65209      |
| Trip distance information                                            | 65210      |
| Trip fan information                                                 | 65211      |

**SPN 1014 – Trip Average Engine Speed**

The equation is as follows:

$$\text{Trip average engine speed} = \frac{\sum_{i=0}^N \text{RPM}(i)}{N} \quad (\text{Eq.SP1014\_A})$$

where:

RPM is the engine speed at sample i, N is the number of samples of engine speed and is proportional to the current trip elapsed time

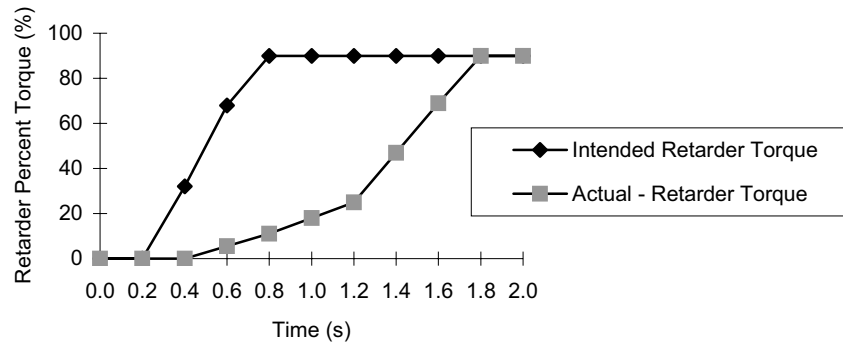
**SPN 1085 – Intended Retarder Percent Torque**

FIGURE SPN1085\_A—INTENDED RETARDER PERCENT TORQUE



## SPN 1107 – Engine Protection System Timer State

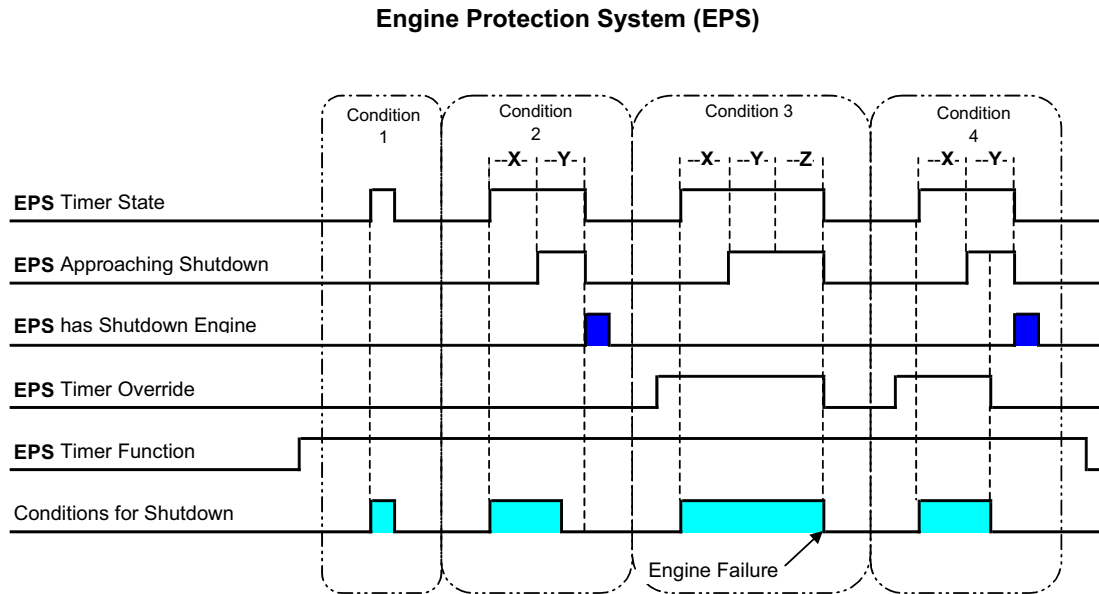


FIGURE SPN1107\_A—ENGINE PROTECTION SYSTEM (EPS)

Condition 1 – When the EPS Timer Override is inactive, the EPS Timer State will become inactive if the conditions for shutdown no longer exist before the "X" time interval has expired or EPS Approaching Shutdown is activated.

Condition 2 – When the EPS Timer Override is inactive and conditions for shutdown exist during the "Y" time interval, then the Engine will shutdown, even though shutdown conditions subside before the "Y" time interval has expired.

Condition 3 – When the EPS Timer Override is active, then the EPS feature shall be overridden allowing for an engine failure when the "Z" time interval has expired.

Condition 4 – When the EPS Timer Override is active and then allowed to go inactive during the "Y" time interval, the response by the EPS shall be the same as condition 2. The time intervals for "X" and "Y" shall always start when conditions for shutdown first commence regardless whether the EPS Timer Override is enabled or not.

NOTE: 0 State – Inactive, disabled in calibration, or conditions for Engine Protection do not exist.

1 State – Active, enabled in calibration, or conditions for Engine Protection do exist.

SPN 1734 – Nominal Level Front Axle

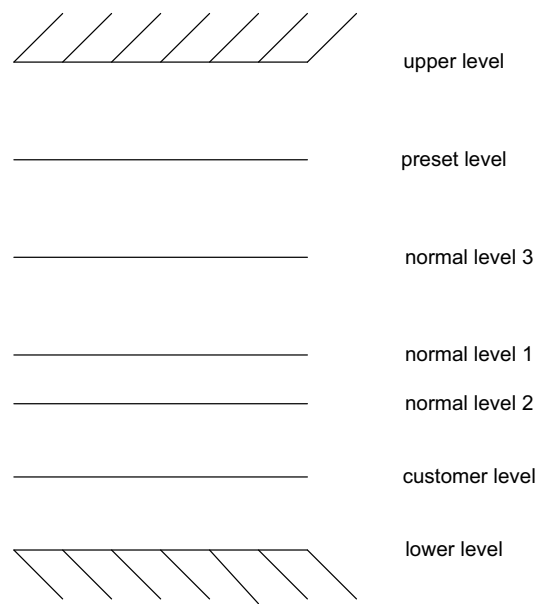


FIGURE SPN1734\_A: EXAMPLE FOR NOMINAL LEVELS

If the vehicle height, to be controlled by the ASC, is not within the tolerances of the defined nominal levels, the nominal level is set to not specified.

The defined vehicle heights can be activated via the ASC 2 (PGN: 53760) message or via a remote control (see figure SPN1734\_B). The remote control is an external unit to operate the suspension system.

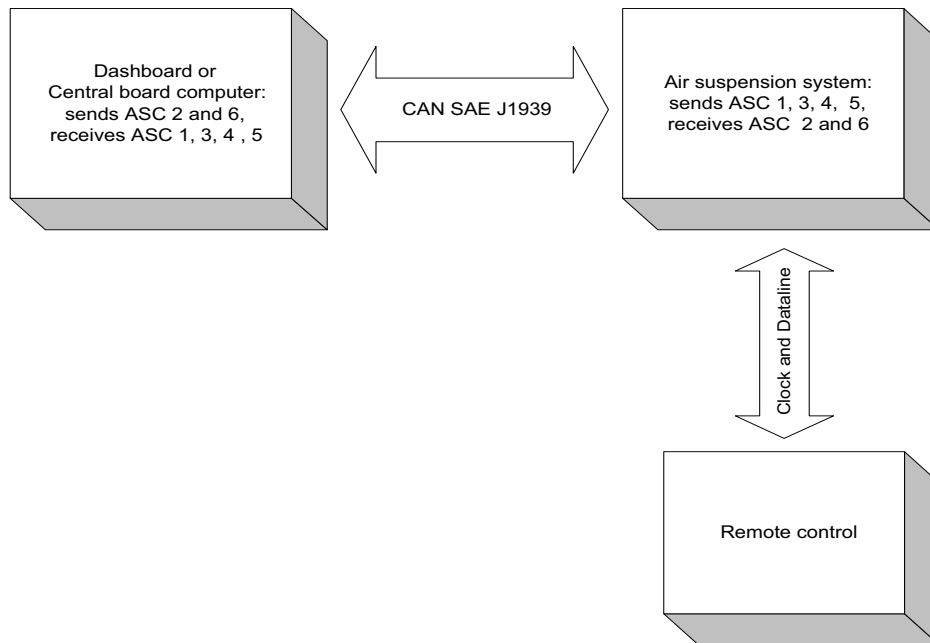
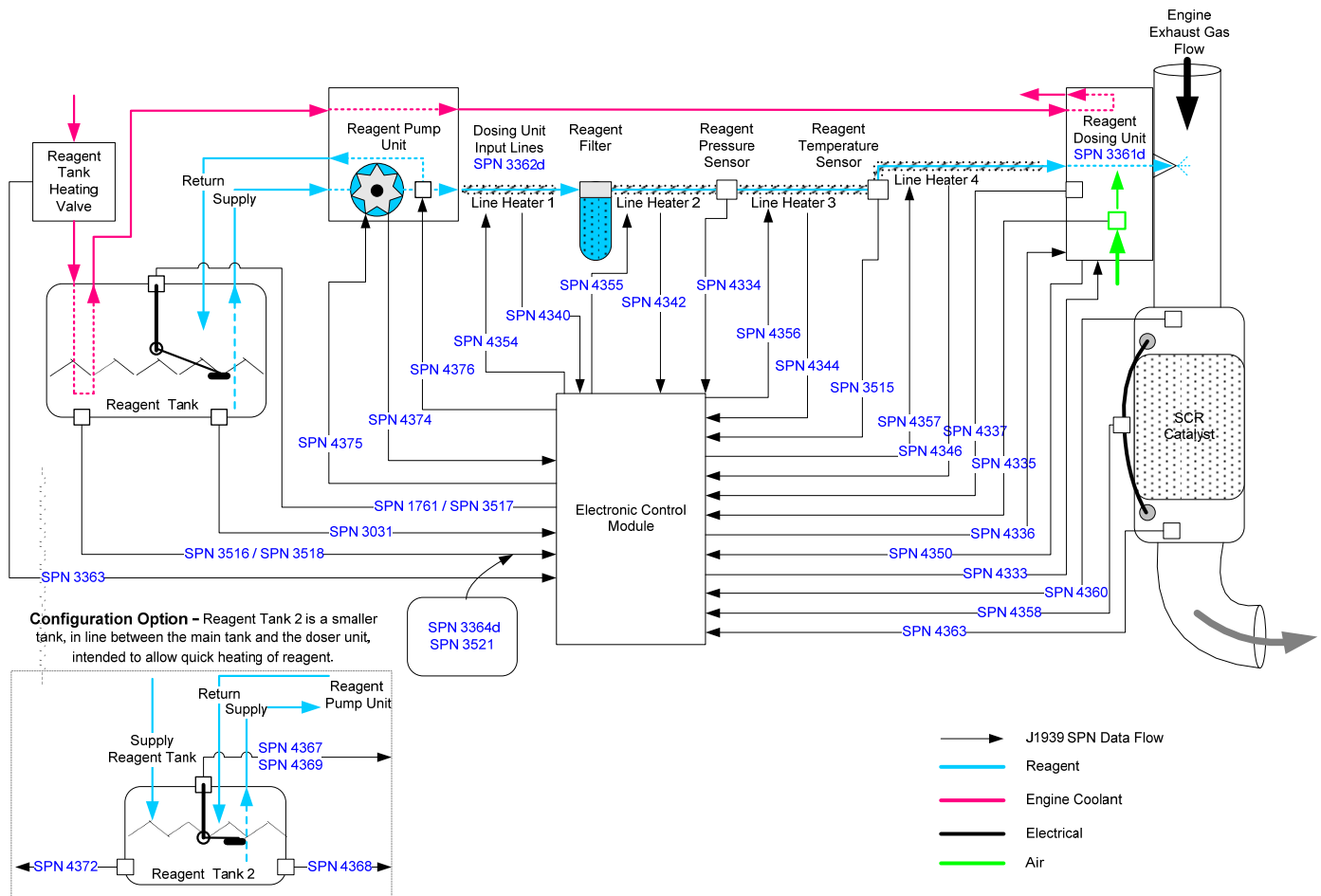


FIGURE SPN1734\_B: POSSIBLE INTEGRATION OF ASC SYSTEM INTO VEHICLE NETWORK

An example: The nominal level is the normal level 1. Via remote control a new nominal level (for instance upper level) is requested. The nominal level is then set to upper level and during the height modification the ASC is indicating that the actual level is below nominal level until the upper level is reached.

## SPN 1761 - Aftertreatment System Diagram



| SPN  | SPN Name                                                                                | SPN   | SPN Name                                                                            |
|------|-----------------------------------------------------------------------------------------|-------|-------------------------------------------------------------------------------------|
| 1761 | Aftertreatment 1 SCR Catalyst Tank Level                                                | 4354  | Aftertreatment 1 SCR Catalyst Reagent Line Heater 1 (request)                       |
| 3031 | Aftertreatment 1 SCR Catalyst Tank Temperature                                          | 4355  | Aftertreatment 1 SCR Catalyst Reagent Line Heater 2 (request)                       |
| 3363 | Aftertreatment 1 SCR Catalyst Reagent Tank Heater                                       | 4356  | Aftertreatment 1 SCR Catalyst Reagent Line Heater 3 (request)                       |
| 3515 | Aftertreatment 1 SCR Catalyst Reagent Temperature 2                                     | 4357  | Aftertreatment 1 SCR Catalyst Reagent Line Heater 4 (request)                       |
| 3516 | Aftertreatment 1 SCR Catalyst Reagent Concentration                                     | 4358  | Aftertreatment 1 SCR Catalyst Exhaust Gas Differential Pressure                     |
| 3517 | Aftertreatment 1 SCR Catalyst Tank Level 2                                              | 4360  | Aftertreatment 1 SCR Catalyst Intake Gas Temperature                                |
| 3518 | Aftertreatment 1 SCR Catalyst Reagent Conductivity                                      | 4363  | Aftertreatment 1 SCR Catalyst Outlet Gas Temperature                                |
| 3521 | Aftertreatment 1 SCR Catalyst Reagent Type                                              | 4367  | Aftertreatment 1 SCR Catalyst Reagent Tank 2 Level                                  |
| 4333 | Aftertreatment 1 SCR Actual Dosing Reagent Quantity (integrator total value)            | 4368  | Aftertreatment 1 SCR Catalyst Reagent Tank 2 Temperature                            |
| 4334 | Aftertreatment 1 SCR Dosing Reagent Absolute Pressure                                   | 4369  | Aftertreatment 1 SCR Catalyst Reagent Tank 2 Level 2                                |
| 4335 | Aftertreatment 1 SCR Dosing Air Assist Absolute Pressure                                | 4372  | Aftertreatment 1 SCR Catalyst Reagent Tank 2 Heater (light-off)                     |
| 4336 | Aftertreatment 1 SCR Dosing Air Assist Valve                                            | 4374  | Aftertreatment 1 SCR Catalyst Reagent Pump Motor Speed (feedback on pump speed)     |
| 4337 | Aftertreatment 1 SCR Dosing Reagent Temperature                                         | 4375  | Aftertreatment 1 SCR Catalyst Reagent Pump Drive Percentage (command to pump)       |
| 4340 | Aftertreatment 1 SCR Catalyst Reagent Line Heater 1 state                               | 4376  | Aftertreatment 1 SCR Catalyst Reagent Return Valve (directional command for return) |
| 4342 | Aftertreatment 1 SCR Catalyst Reagent Line Heater 2 state                               | 3361d | Aftertreatment 1 SCR Catalyst Dosing Unit                                           |
| 4344 | Aftertreatment 1 SCR Catalyst Reagent Line Heater 3 state                               | 3362d | Aftertreatment 1 SCR Catalyst Dosing Unit Input Lines                               |
| 4346 | Aftertreatment 1 SCR Catalyst Reagent Line Heater 4 state                               | 3364d | Aftertreatment 1 SCR Catalyst Tank Reagent Quality                                  |
| 4350 | Aftertreatment 1 SCR Requested Reagent Quantity for Integrator (integrator total value) |       |                                                                                     |

FIGURE SPN1761 – Example Aftertreatment System Schematic

**SPN 2432 – Engine Demand - Percent Torque****Background:**

During periods of TSC#1 engine control, other devices on the J1939 network may wish to know where the engine wants to go once it is released from TSC#1 control. In order for option transitions of driveline torque between different devices, it becomes necessary to understand the *engine's* desired torque for all phases of a TSC#1 control sequence.

- (R) Driver's Demand Engine – Percent Torque (SPN 512) provides a partial prediction of the torque the engine wishes to produce after a TSC#1 command is removed. Included in Driver's Demand Torque are external requestors to the powertrain such as accelerator pedal, cruise control, and road speed limit governors. However, *excluded* from DDT are (1) dynamic commands within the powertrain such as smoke control, noise control, and low and high speed engine governing, and (2) external TSC#1 commands to the engine such as those generated by traction control, unless SPN 3350 in the received TSC1 message is equal to P1 (Accelerator Pedal / Operator Selection), P2 (Cruise Control), P3 (PTO Governor), or P4 (Road Speed Governor). Since those control purposes originate from the driver, they shall be included in the calculation of DDT.

For a controller to properly determine the engine's desired output torque during a TSC#1 sequence, it needs knowledge of the torque being scheduled by all active controls within the engine. Since DDT excludes many of these active controllers from its calculation, it cannot be used to accurately predict the desired output torque. The effects of the external TSC#1 commands can be approximated by other devices by means of monitoring TSC#1 messages to the engine; however the effects of the engine's internal dynamic commands are completely unknown and cannot be estimated.

Actual Engine – Percent Torque (SPN 513) provides a window to the engine's desired torque output when no TSC#1 commands are actively controlling the engine. However, when the engine is responding to TSC#1 commands, the Actual Engine – Percent Torque parameter is no longer indicative of the torque that the engine will produce once those TSC#1 commands are removed.

In simplest terms, Engine Demand – Percent Torque (or "EDT") contains the engine's internal dynamic commands that are excluded from the Driver's Demand Engine – Percent Torque definition, including smoke control, noise control, and low and high speed governing. With this additional piece of information, devices on the network that are controlling the engine via TSC#1 messages can determine the torque direction of the engine once the current TSC#1 command is relinquished.

It is important to note that the proposed EDT parameter is used as information. The addition of the EDT parameter should in no way cause a change to the engine's actual torque command architecture.

**EDT Calculation:**

When no devices are controlling the engine via TSC#1 messages, the value of EDT is equal to the Actual Engine – Percent Torque parameter. When the engine is being controlled via a TSC#1 message, it is necessary for the engine controller to calculate what its' target torque *would be* if there were no external commands being received. This "runner up" in engine control will come from internal dynamic engine commands.

In the calculation of Actual Engine – Percent Torque, the output of the engine's idle governor must be considered, along with the impact of the engine's full load governor, smoke controls and other internal limiting logic. In the determination of the Engine Demand Torque parameter, these same engine logic components are needed, as indicated in Figure SPN 2432\_A. However, there is a significant difference: These components only affect the Actual Engine – Percent Torque parameter determination if they are the component *actively* controlling the engine. In EDT, any of these components will be used to calculate EDT if they are the "runner up" for engine control. Even though these components may lose in the engine's internal control arbitration, the engine output torque that they would produce if in command needs to be found to determine EDT.

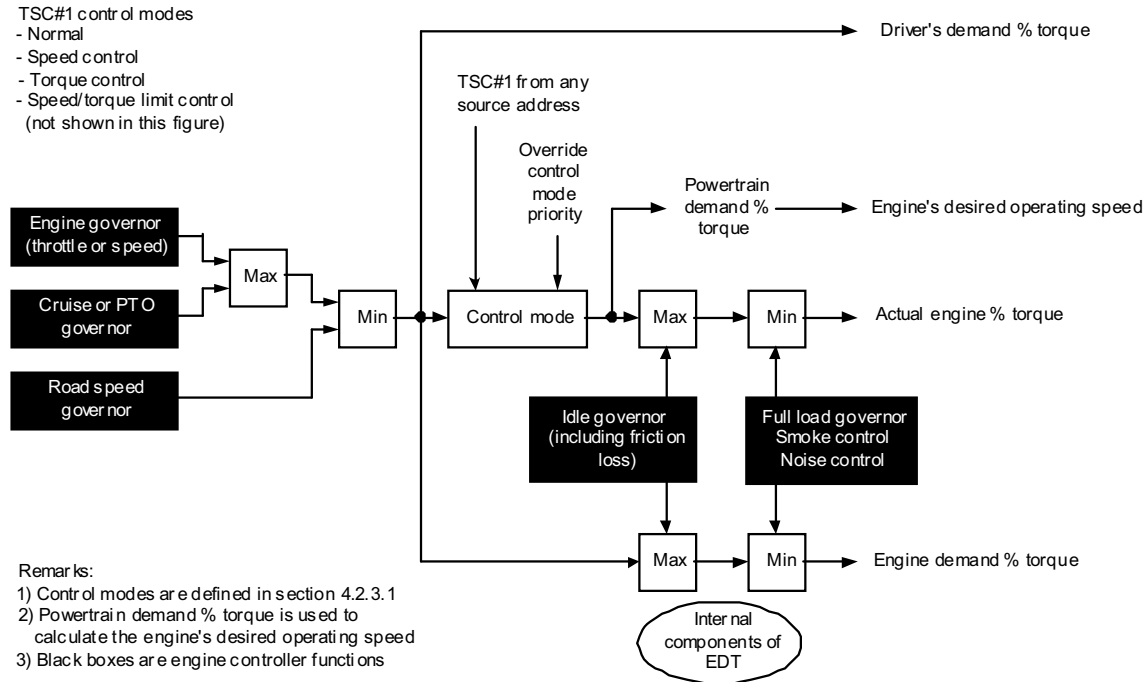


FIGURE SPN2432\_A – TORQUE COMMANDS AND CALCULATIONS WHEN A “MAXIMUM LOW IDLE” TECHNIQUE IS USED

If speed governors are involved in determining these components of the EDT calculation, any of the following 3 special cases may need to be addressed:

#### Special Case #1: Speed Governors

If the engine governor referenced in Figure SPN2432\_A is a speed-based governor instead of a throttle table arrangement, a new challenge is presented in determining EDT. Since the speed governor output is directly influenced by the TSC#1 command in control (for example, integrator anti-windup logic), the speed governor's output during TSC#1 commands cannot be used to calculate EDT.

Instead, an *approximation* of the speed governor output without the effects of any TSC#1 commands is required for use in the EDT calculation. “Approximation” refers to removing the effects of integrator terms and any other dynamic components that result from the controlling TSC#1 commands. All elements affecting the speed governor reference should be included before the reference is translated into terms of torque.

All control algorithms with dynamic elements (e.g., speed governors) that execute during TSC#1 commands need to have their outputs replaced by “steady-state” approximations for use in the EDT calculation. Again note that these approximations are for use only in the EDT calculation; the actual engine control logic remains unchanged.

Figure SPN2432\_B illustrates EDT and speed governor output during a typical control sequence. The output of the speed governor may tend to lag the engine's torque trace during and after the TSC#1 command sequence. Note however that the TSC#1's influence is not factored into EDT; only when the command sequence ends or is no longer winning in terms of engine control arbitration do the dynamic effects of the speed governor(s) appear in the EDT signal.

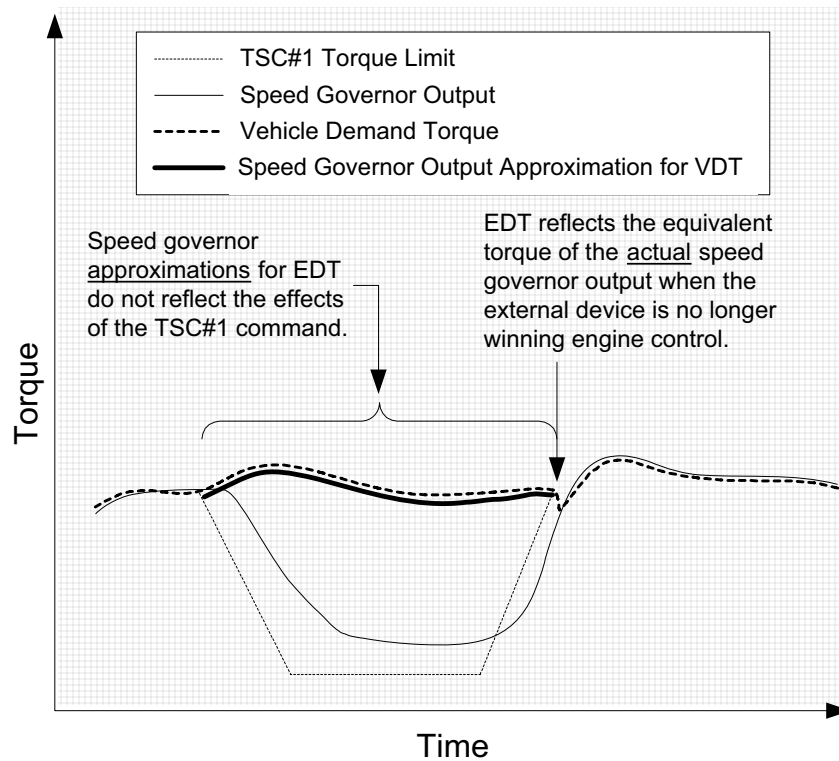


FIGURE SPN2432\_B – EDT AND SPEED GOVERNOR OUTPUT RELATIONSHIP DURING A CONTROL SEQUENCE

One method of converting the speed governor reference to torque is shown in Figure SPN2432\_C. The inputs of current engine speed, accelerator pedal position and the shape of the governor droop curves can be used to find the equivalent torque output of the governor. A lookup table or calculation could be used.

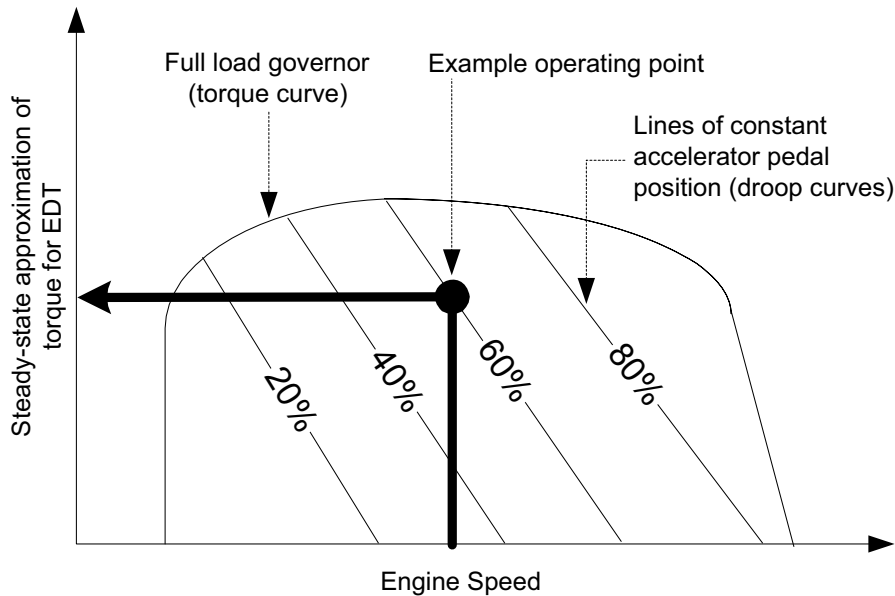


FIGURE SPN2432\_C - FINDING EDT TORQUE APPROXIMATION FOR A SPEED GOVERNOR

#### Special Case #2: “Steep” or zero droop speed governors

Using a steady-state approximation with a “steep” or zero droop speed governor can cause large EDT changes over small speed changes. For example, if a cruise control governor has a zero droop and the vehicle speed is just below the cruise set speed, the steady-state torque approximation using the method described previously is very large. If vehicle speed increases a small amount to above the cruise set speed, the steady-state torque approximation becomes very small or zero.

As a result, a more accurate steady-state torque approximation is needed when steep droop governors are involved. A steep droop speed governor is defined as having a droop slope greater than 0.2% actual torque per rpm as seen below in Figure SPN2432\_D.

The following method can be used to determine a steady-state torque approximation for steep or zero droop governors with fast responding integrator anti-windup / integrator resetting:

Upon a TSC#1 message actively controlling engine torque, save the last value of torque commanded by the speed governor ( $\tau_{SG0}$ ) and the last value of speed governor error ( $\epsilon_{SG0}$ ).

During this control sequence, calculate speed governor error ( $\epsilon_{SGi}$ )

Calculate an estimated torque for EDT determination use:  $\tau_{SG\text{Estimated}} = \tau_{SG0} + K_{pSG} * (\epsilon_{SG0} - \epsilon_{SGi})$

where  $K_{pSG}$  is the speed governor proportional gain



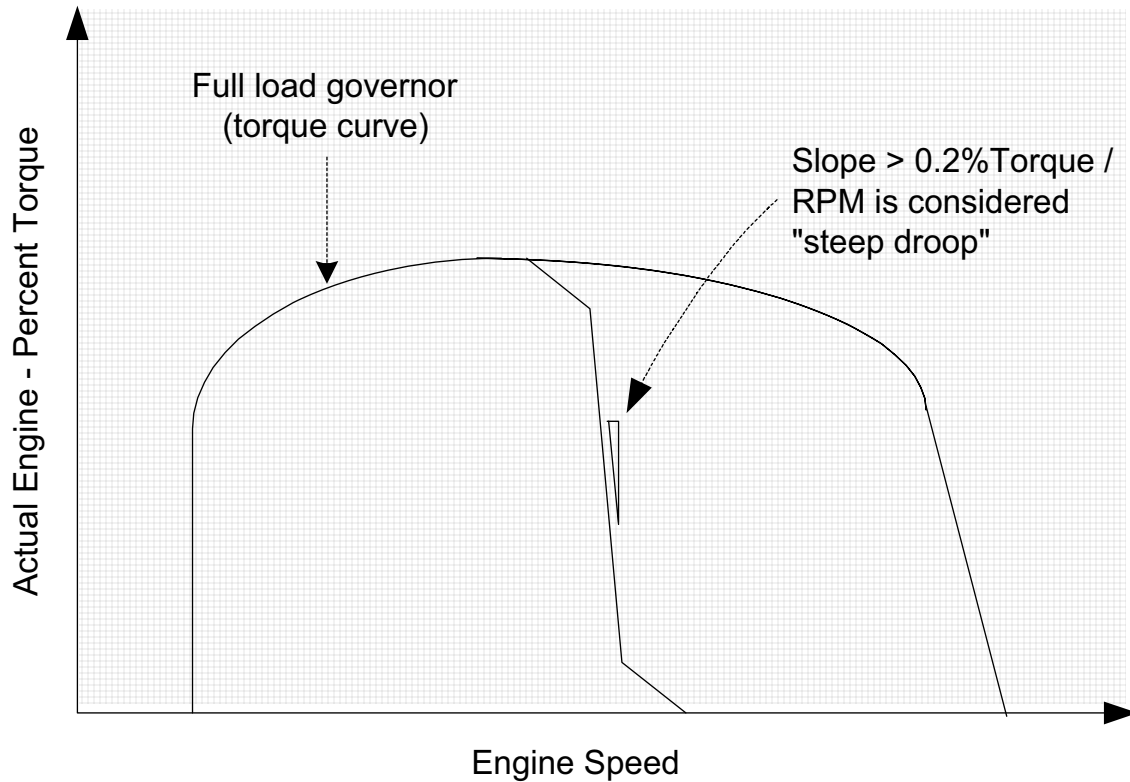


FIGURE SPN2432\_D - EXAMPLE OF "STEEP DROOP" SPEED GOVERNOR

### Special Case #3: "Slow Response" Speed Governors

If the speed governor dynamic elements are slow to respond to a 1 second torque derate, then the speed governor can simply be executed during the TSC#1 event and the output used directly in determining EDT. This is an alternative for a speed governor which does not contain an integrator, or if the integrator anti-windup logic is slow to respond. A guideline for "slow response" is that the governor output after 1 second of torque limiting has only moved 1/3 of the way to the limit, as shown for example in Figure SPN2432\_E.

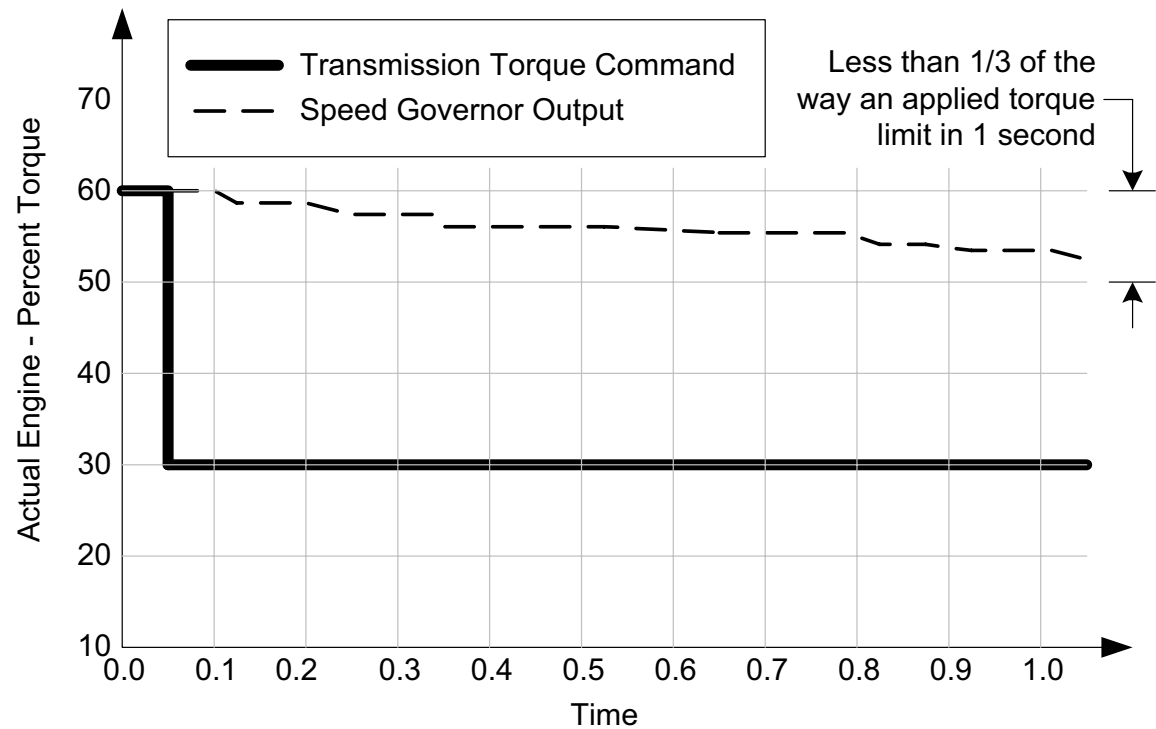


FIGURE SPN2432\_E – EXAMPLE OF “SLOW TO RESPOND” SPEED GOVERNOR

**SPN 2927 - Actual Inner wheel steering angle**

Following sketch shows an example for the actual inward wheel angles of the steering axles in the requested PGN :

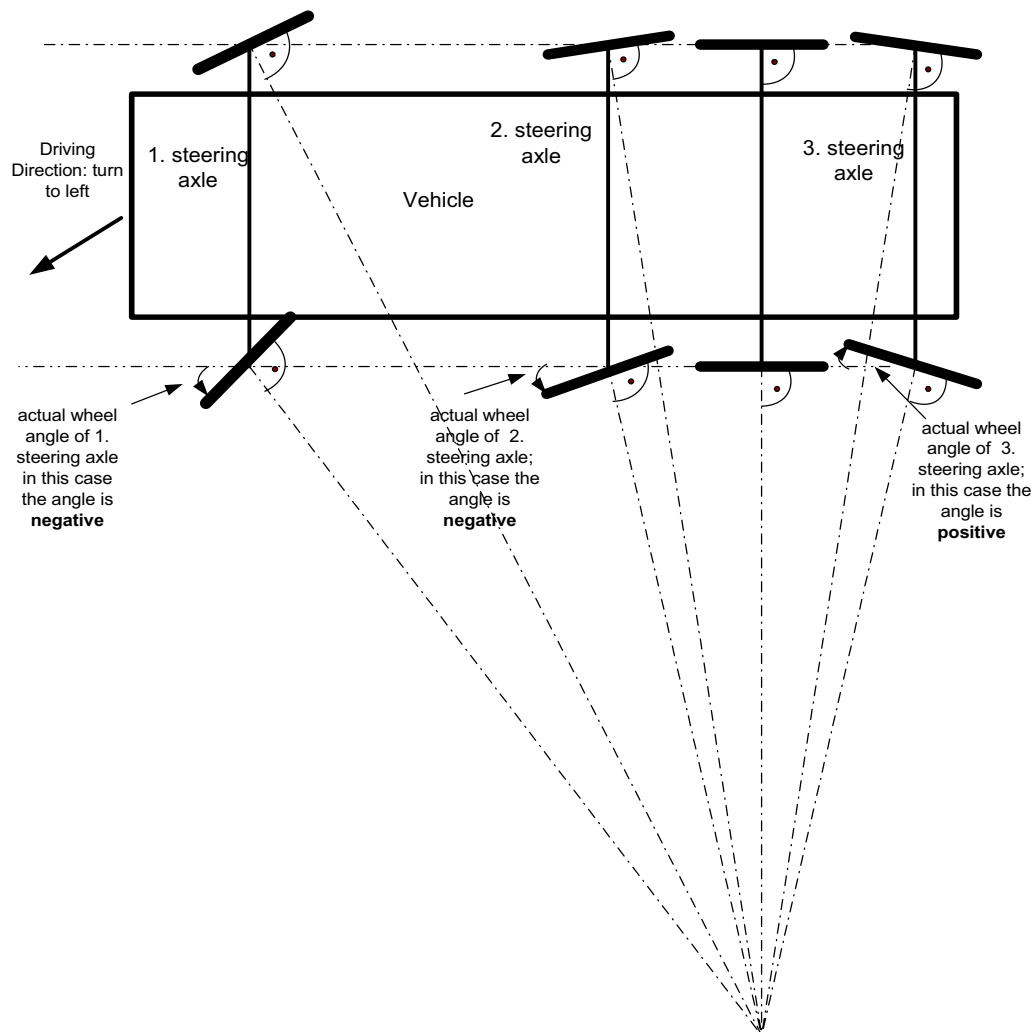


FIGURE SPN2927\_A: STEERING AXLE ORIENTATION

## SPN 3697 – Diesel Particulate Filter Lamp Command

|                             |                                                                | SAE J1939 Parameters                                            |                                                                      |                                                                                          |                                                                                                                                                                                                                          |                                             | DM1 Message                                                                            |
|-----------------------------|----------------------------------------------------------------|-----------------------------------------------------------------|----------------------------------------------------------------------|------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|----------------------------------------------------------------------------------------|
| State of Regeneration Cycle |                                                                | SPN 3697 - Diesel Particulate Filter Lamp Command               | SPN 3698 - Exhaust System High Temperature Lamp Command <sup>1</sup> | SPN 3703 - Diesel Particulate Filter Active Regeneration Inhibited Due to Inhibit Switch | SPN 3700 - Diesel Particulate Filter Active Regeneration Status                                                                                                                                                          | SPN 3701 - Diesel Particulate Filter Status |                                                                                        |
| 1                           | Regeneration not needed                                        | 000                                                             | 000                                                                  | 00                                                                                       | 00                                                                                                                                                                                                                       | 000                                         | Per active DTCs                                                                        |
| 2                           | Regeneration needed – Request Level                            | 001                                                             | 000                                                                  | 00                                                                                       | 10                                                                                                                                                                                                                       | 001                                         | Per active DTCs                                                                        |
| 3                           | Regeneration needed – Warning Level                            | 100                                                             | 000                                                                  | 00                                                                                       | 10                                                                                                                                                                                                                       | 010                                         | Per active DTCs                                                                        |
| 4                           | Regeneration needed - Service Level                            | 100                                                             | 000                                                                  | 00                                                                                       | 10                                                                                                                                                                                                                       | 011                                         | Per active DTCs. Amber Lamp shall be on with active DTC indicating regeneration level. |
| 5                           | Regeneration needed – Stop Level                               | 100                                                             | 000                                                                  | 00                                                                                       | 10                                                                                                                                                                                                                       | 011                                         | Per active DTCs. Red Lamp shall be on with active DTC indicating regeneration level.   |
| 6                           | Manual Regeneration Request Acknowledge                        | Per Filter Status - lamp will reflect actual level of DPF fill. | 000                                                                  | 00                                                                                       | At transition. Change to 01 following switch input.                                                                                                                                                                      | Per appropriate regeneration needed level   | Per active DTCs                                                                        |
| 7                           | Regeneration active with exhaust temperature above a threshold | Per Filter Status - lamp will reflect actual level of DPF fill. | 001                                                                  | 00                                                                                       | 01                                                                                                                                                                                                                       | Per appropriate regeneration needed level   | Per active DTCs                                                                        |
| 8                           | Regeneration active with exhaust temperature below a threshold | Per Filter Status - lamp will reflect actual level of DPF fill. | 000                                                                  | 00                                                                                       | 01                                                                                                                                                                                                                       | Per appropriate regeneration needed level   | Per active DTCs                                                                        |
| 9                           | Regeneration Inhibit Acknowledge                               | Per Filter Status - lamp will reflect actual level of DPF fill. | Per exhaust temperature.                                             | At transition. From 00 to 01 following switch input.                                     | The following is for information only during this state: If SPN 3700 is equal to 01, then it will change from 01 to the appropriate state following switch input. If it is not equal to 01, then value remains the same. | Per appropriate regeneration needed level   | Per active DTCs                                                                        |

The diesel particulate filter (DPF) thresholds used in the explanations below are relative to each other in the following manner: Request Level < Warning Level < Service Level < Stop Level

1. Regeneration not needed: Amount of particulate matter in DPF is below the request level threshold.
2. Regeneration needed - Request Level: Amount of particulate matter in DPF has exceeded request level threshold, but has not exceeded the warning level threshold.
3. Regeneration needed - Warning Level: Amount of particulate matter in DPF has exceeded warning level threshold, but has not exceeded the service level threshold.
4. Regeneration needed - Service Level: Amount of particulate matter in DPF has exceeded service level threshold, but has not exceeded the stop level threshold.
5. Regeneration needed - Stop Level: Amount of particulate matter in DPF has exceeded stop level threshold.
6. Manual Regeneration Request Acknowledge: When the operator sets the SPN 3696 Diesel Particulate Filter Regeneration Force Switch to 01, then SPN 3700 will indicate that regeneration is active.
7. Regeneration active with exhaust temperature above a threshold: Needs no explanation.
8. Regeneration active with exhaust temperature below a threshold: Needs no explanation.
9. Regeneration Inhibit Acknowledge: If the operator has activated the Diesel Particulate Filter Regeneration Inhibit Switch (SPN 3695), then another device on the network can detect this event by monitoring SPN 3703 to change from 00 to 01.

The actual values of all thresholds referenced above are defined by the manufacturer.

Note <sup>1</sup>: In addition to the above table, the exhaust system high temperature lamp can be set due to high exhaust temperatures that are independent of a regeneration cycle.

**FIGURE SPN3697\_A – DIESEL PARTICULATE FILTER LAMP COMMAND**

**SPN 3785 – Tractor Brake Stroke System**

The brake stroke system has essentially two inputs:

- 1) Sensor at each actuator that allows the determination of 3 regions of stroke (Fully Returned, Normal Stroke Range, or Overstroke Range)
- 2) A sensor to detect the use of the brake pedal (similar to Stop Light Switch)

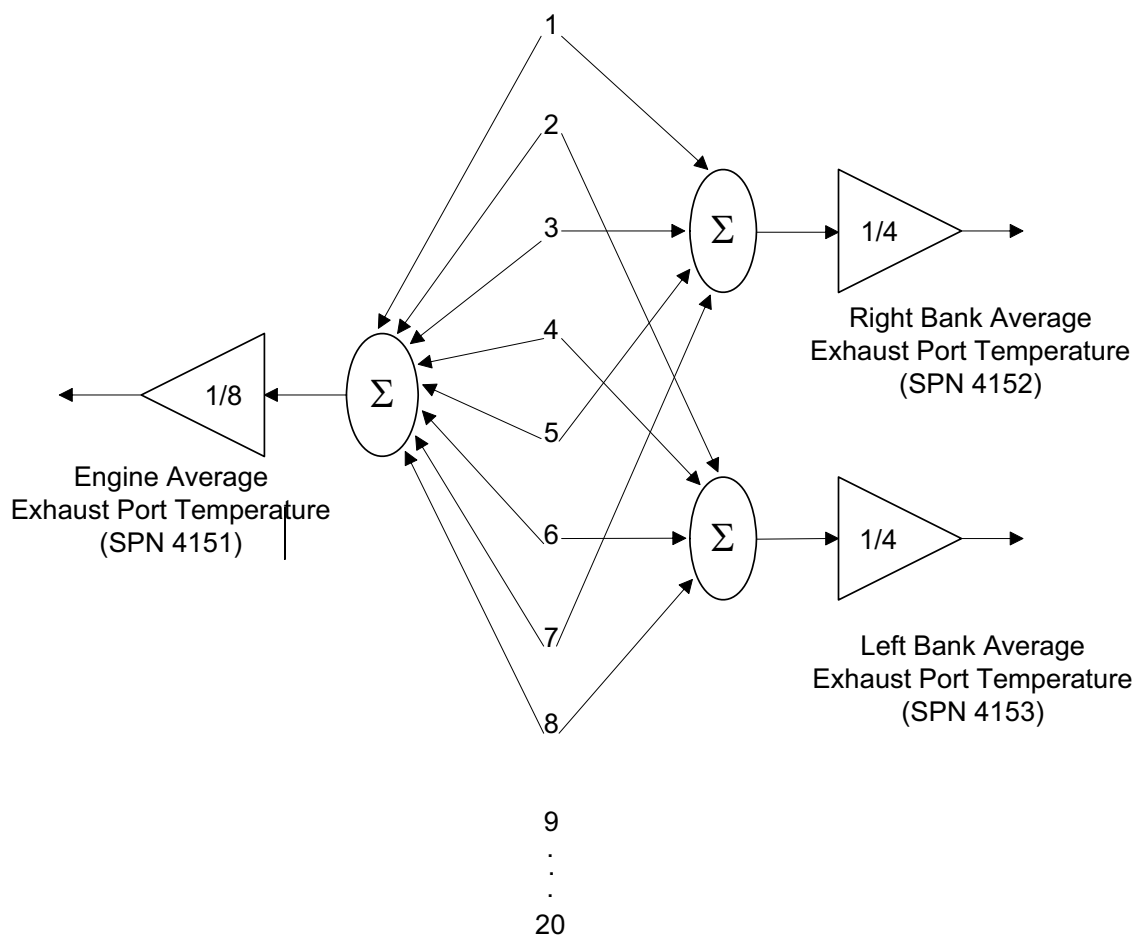
The ECU then determines the brake stroke status as follows:

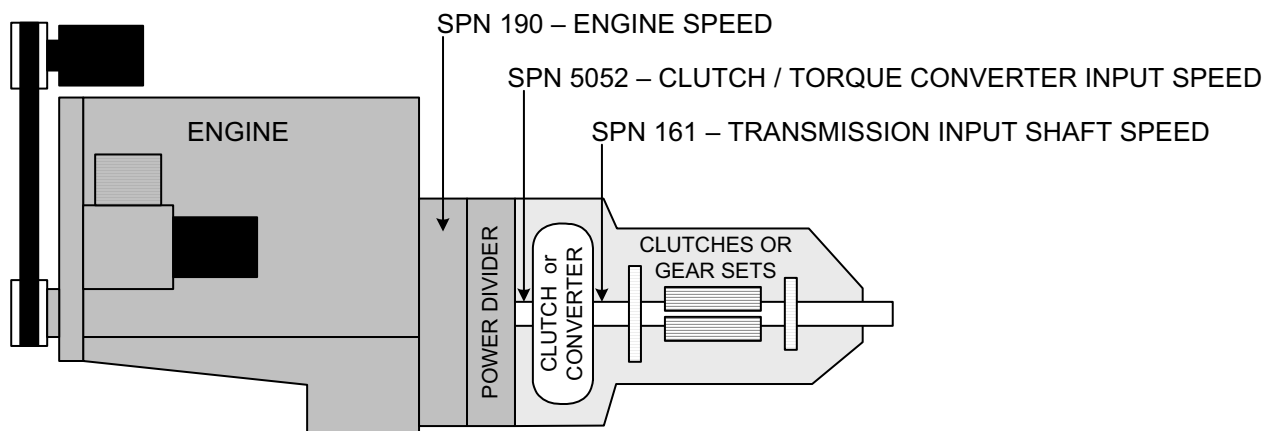
|               |            | Brake Pedal |                |
|---------------|------------|-------------|----------------|
|               |            | OFF         | ON             |
|               |            | OK          | Non-functional |
| Stroke Sensor | RETURNED   | OK          | Non-functional |
|               | NORMAL     | Dragging    | OK             |
|               | OVERSTROKE | Dragging    | Overstroke     |

**FIGURE SPN3785\_A – Tractor Brake Stroke Definitions**

**SPN 4151 – Engine Exhaust Gas Temperature Average**

Up to 3 different exhaust port temperature averages will be computed. These three averages include the left bank average exhaust port temperature, the right bank average exhaust port temperature and the engine average exhaust port temperature. The example below illustrates how these averages would be computed for a V8 engine configuration. Inline engines would utilize SPN 4151 for Engine Average Exhaust Temperature.

**FIGURE SPN4151\_A – Engine Exhaust Gas Temperature Averaging Method**

**SPN 5052 – Clutch/Torque Converter Input Speed****FIGURE SPN5052\_A – Power Divider Schematic**

## (R) SPN 5275 – PARK BRAKE ACTIVATION

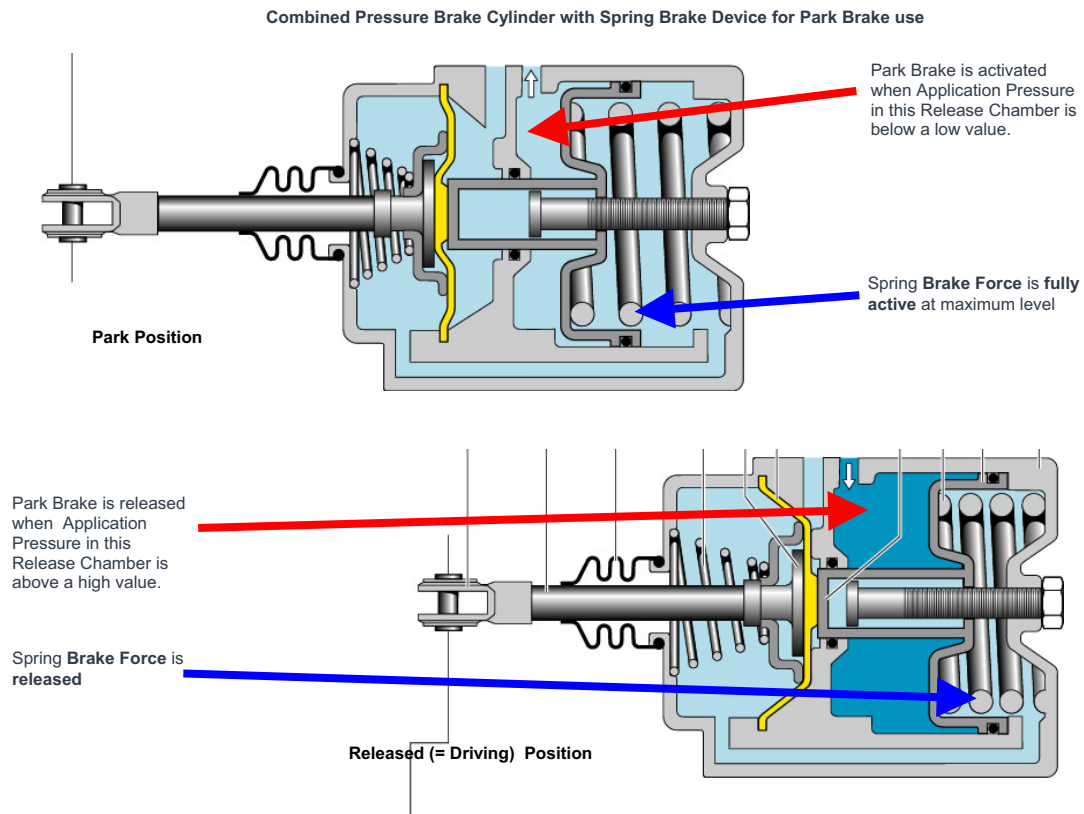


FIGURE SPN\_5275A – PARK BRAKE ACTIVATION



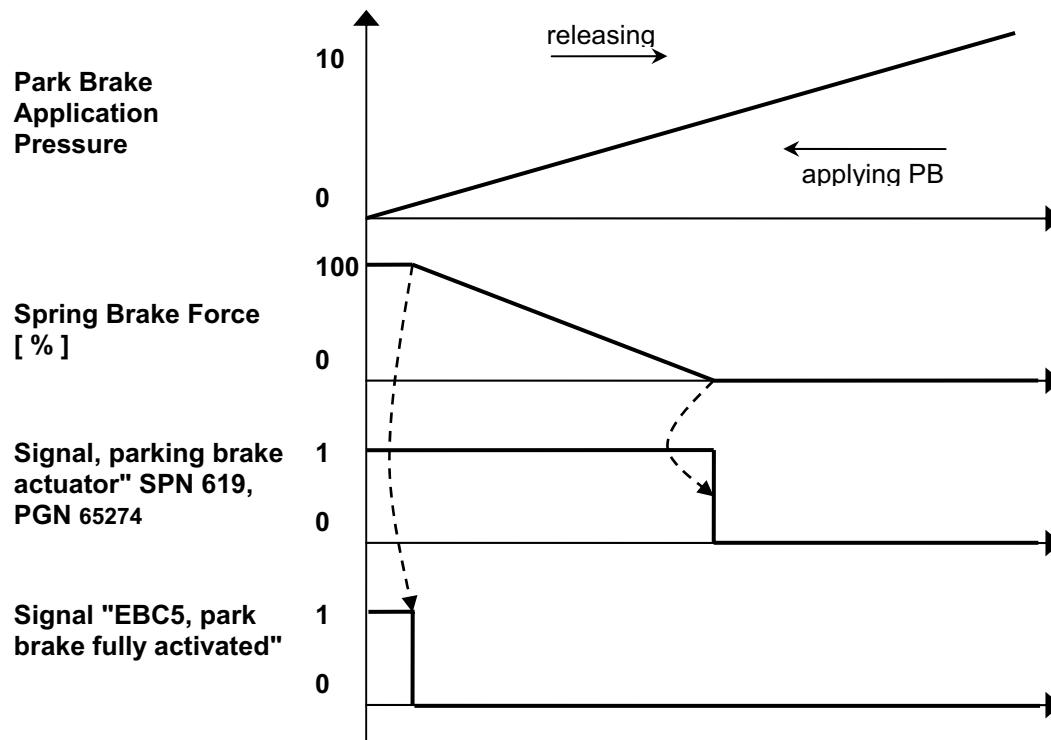


FIGURE SPN\_5275B – PARK BRAKE ACTIVATION STATES

## PGN 1024 – External Brake Request

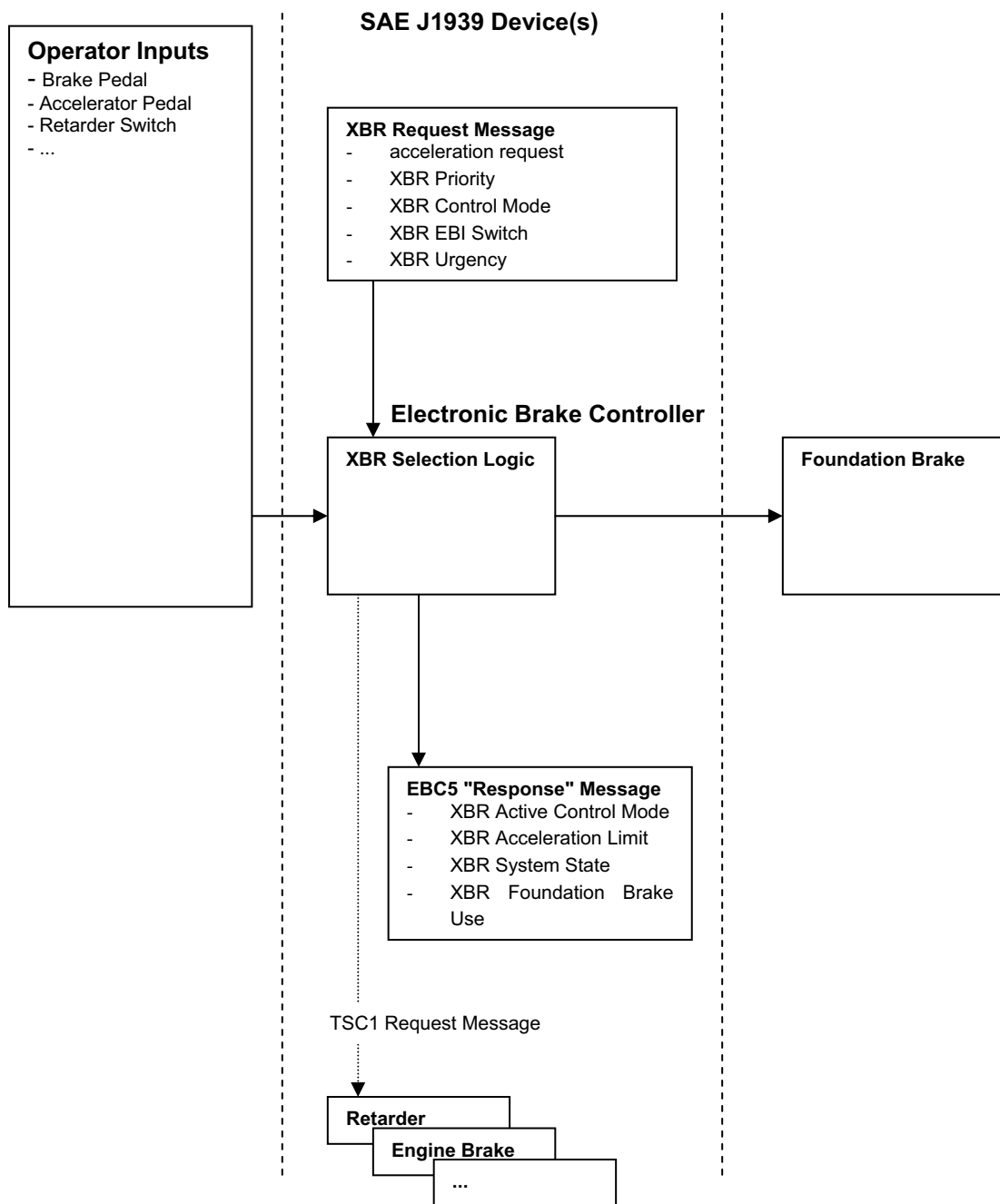
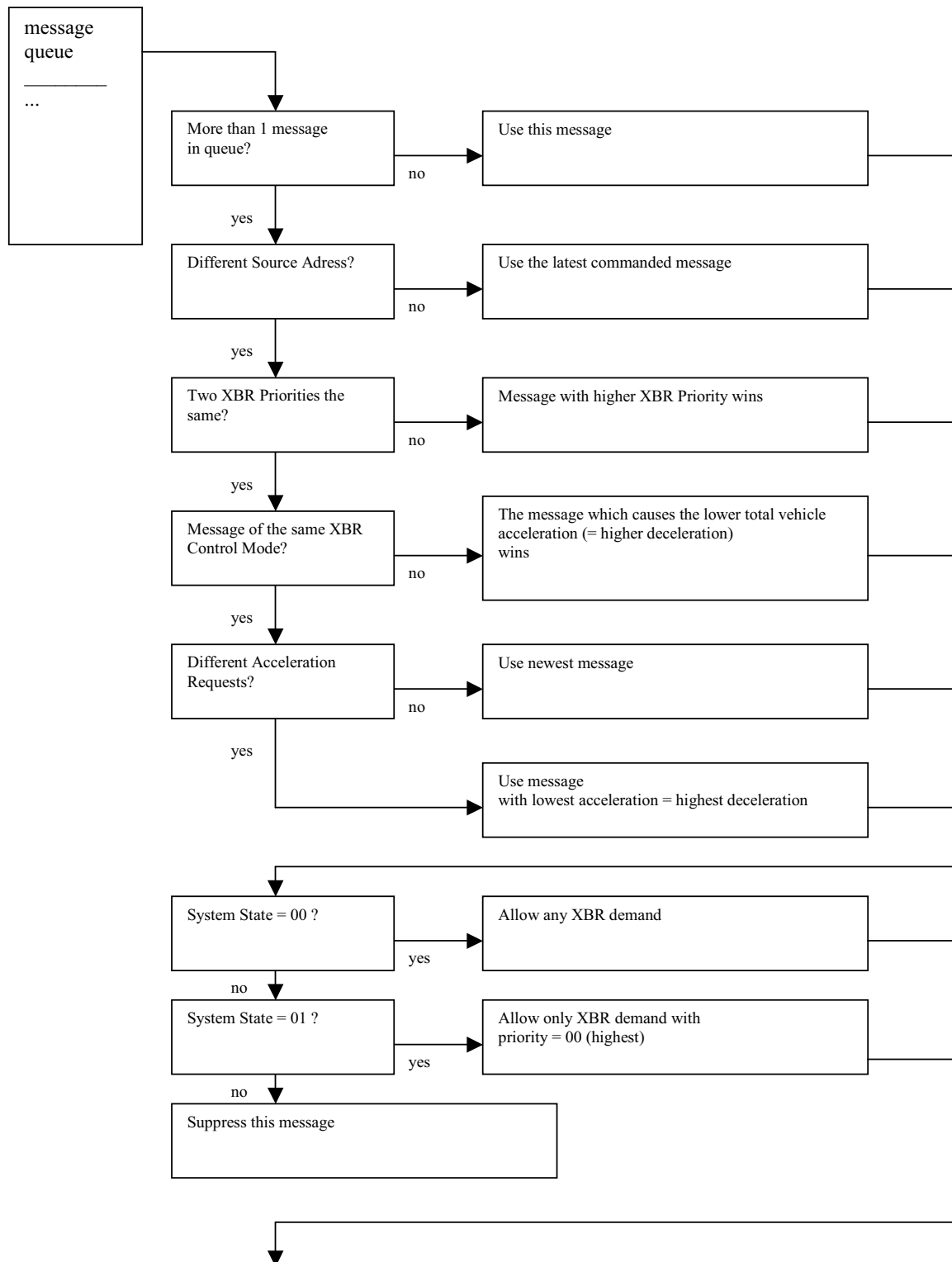


FIGURE PGN1024\_A - DATA FLOW DIAGRAM FOR EXTERNAL BRAKE REQUEST

FIGURE PGN1024\_A - Data Flow Diagram for External Brake Request



(Continued on next page)

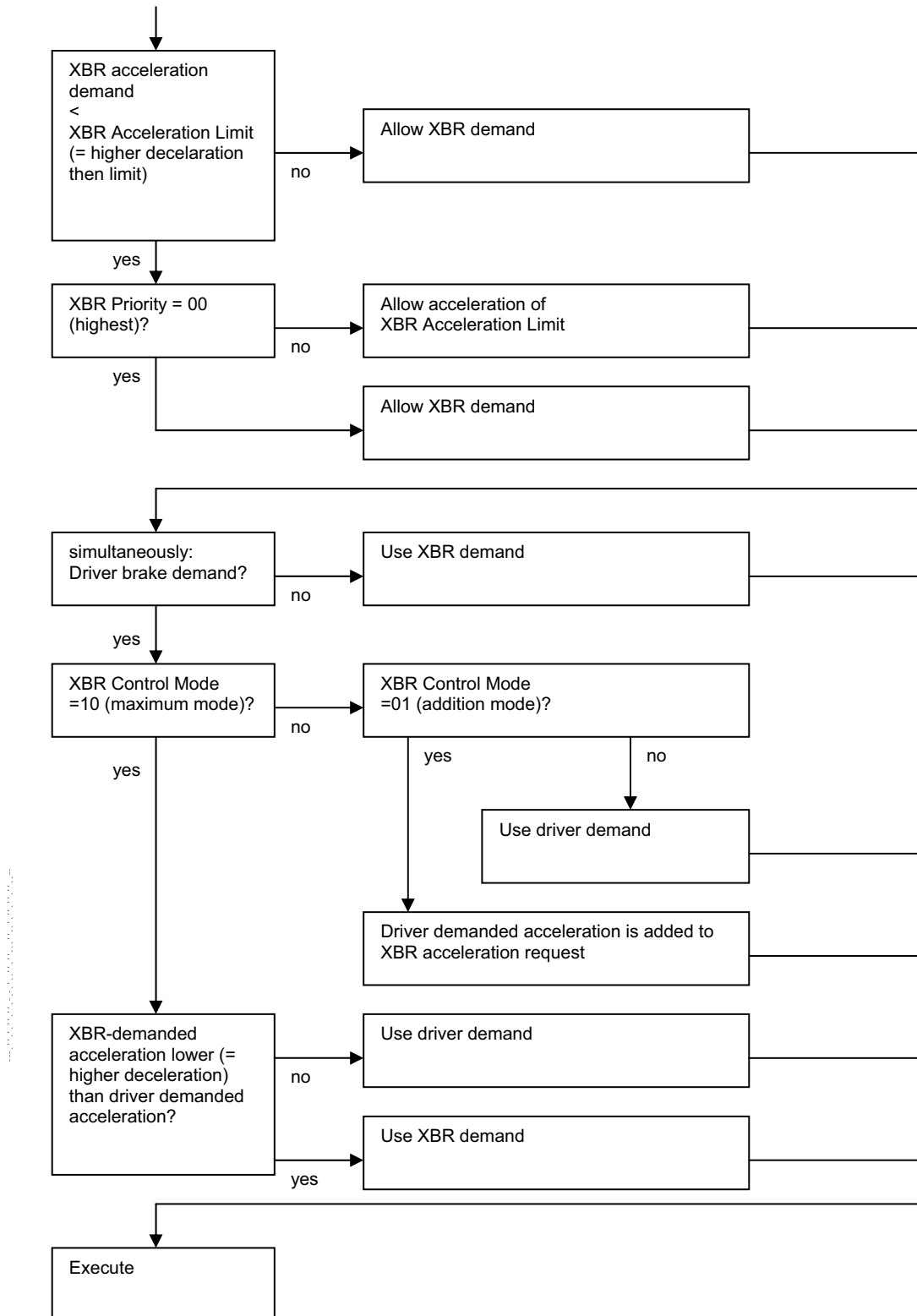


FIGURE PGN1024\_B - XBR PRIORITY SELECTION LOGIC

## PGN 39680 – Proprietary Messaging Information

This PGN allows an ECU to report basic information about its data methods for the PropA, PropA2, and PropB messages for ECUs to determine proprietary messaging compatibility. Once proprietary messaging compatibility is determined through this PGN, then those ECUs could rely upon messages within that compatible proprietary space to negotiate more specific details of compatibility, such as the set of messages specifically supported and the data dictionary details. An accurate assessment of the proprietary messaging compatibility between ECUs in a network is vital to avoiding system operational hazards resulting from improper interpretation of proprietary messages.

Using the J1939 Proprietary Messages (PropA, PropA2, and PropB) for communications between ECUs in a system requires ECUs to determine which, if any, of the other ECUs support and use the same data methods (i.e. data dictionary, ID assignments, data field structures, etc). Presently, the only SAE J1939 standardized data available to ECUs for determining such proprietary messaging compatibility is the Manufacturer Code parameter in the J1939 NAME reported in the address claim message. This information is marginally sufficient for ECUs to limit proprietary messaging use with peer ECUs of the same Manufacturer Code. However, this information is not sufficient when proprietary messaging is needed between ECUs with different Manufacturer Codes.

Using proprietary messages to communicate between ECUs from different manufacturers requires design time negotiations between manufacturers to establish the data dictionary, message IDs, etc. Often only a small range of message IDs are sectioned off for these interactions and the rest of the proprietary space in each ECU is the native proprietary language of that manufacturer. When using the PropA and PropA2 messages, an ECU can restrict to only those sent specifically to its address and validate the Manufacturer Code and other NAME elements of the Source Address before applying the negotiated methods. However, it is possible that the negotiated language for the sectioned off IDs is applicable by each manufacturer for those specific components, and such space may have different language rules for other components or similar components on other systems. When using the PropB messages, an ECU can only cross reference the Manufacturer Code and other NAME elements of the Source Address. However, it is not possible to determine how the message source has encoded the message or if the source even intended for the ECU to use the message. Consequently, the J1939 NAME is not really sufficient for determining any compatibility for the PropA, PropA2, and PropB messages.

### Notes

The data field consists of zero or more Proprietary Method data structures. Each Proprietary Method data structure consists of a Manufacturer Code parameter and a Method ID parameter. The J1939 Manufacturer Code values (J1939 Table B10) shall serve as the enumeration standard for the Manufacturer Code. The Method ID parameter is a 21-bit value defined and set by the manufacturer.

Each Proprietary Method structure allow an ECU to essentially say "This ECU supports Manufacturer X's Proprietary Method '123' ". Since the message supports the ability to report multiple Proprietary Methods, this structure allows an ECU to essentially say:

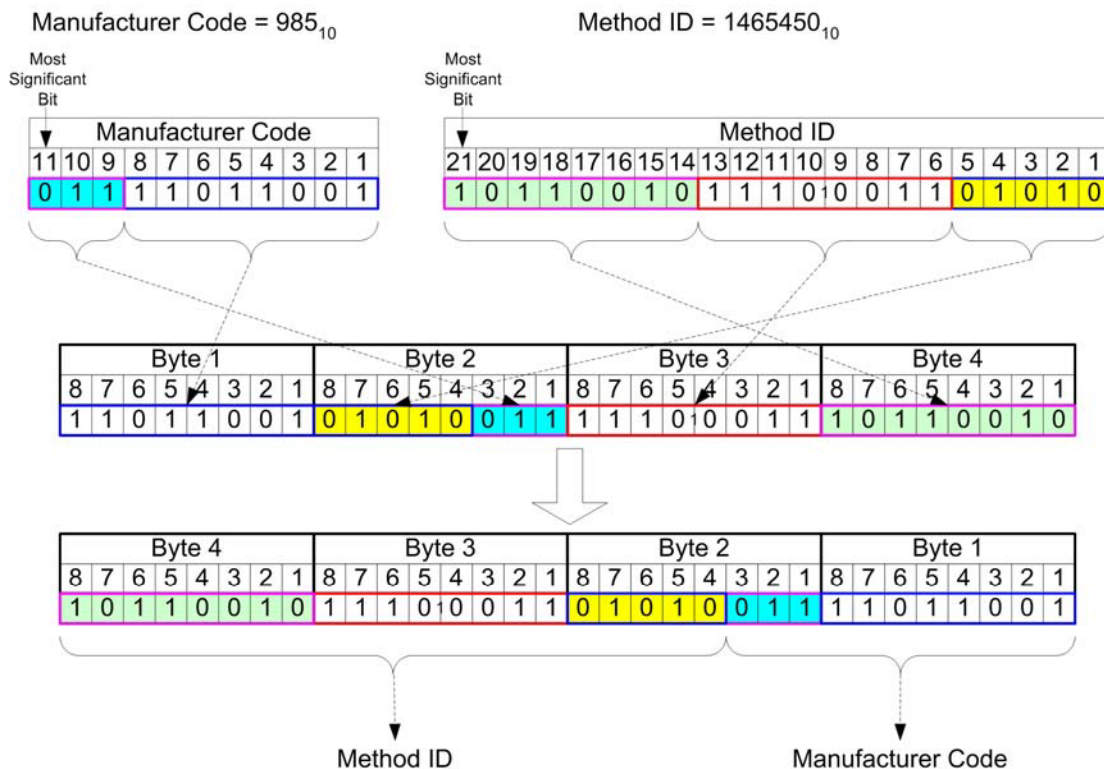
"This ECU supports  
Manufacturer X's proprietary method '123'  
Manufacturer X's proprietary method '456'  
Manufacturer Y's proprietary method '321' "

In the above example, Manufacturer X method 123 (X-123) might be for PropA messaging and may have a set of the rules for discovering further PropA proprietary details. Those ECUs with X-123 knowledge will be able to perform the discovery and possibly initiate messaging conversations using the X-123 methods. The Manufacturer X method 456 (X-456) might be for PropA2 messaging and may have a set of the rules for discovering further PropA2 proprietary details. Similarly, those ECUs with X-456 knowledge will be able to perform the discovery and possibly initiate messaging conversations using the X-456 methods. Finally, an ECU could limit acceptance and interpretation of proprietary messages only to those ECUs that indicate specific Proprietary Methods. When establishing proprietary messaging between ECUs with different manufacturer codes, the parties can establish the Proprietary Method ID which indicates the use of the that specific negotiated messaging.

A destination specific message is requested to allow an ECU to customize its message response for the requesting device.

This is a standardized mechanism for an ECU to report a listing of the manufacturer specific (i.e. proprietary) methods it supports when using the PropA, PropA2, and PropB PGNs. The ability to support multiple manufacturer proprietary methods allows manufacturers to collaborate on application specific communication needs that are not of interest to the SAE J1939 committee. The process of selecting a specific method for ECUs that list multiple mutually exclusive methods is intended to be defined by the manufacturer and therefore not within the scope of this PGN.

NOTE—The placement of the Manufacturer Code and Method ID bits into the 4-byte space is illustrated in Figure PGN39680\_A.



**Figure PGN39680\_A - Placement of Manufacturer Code and Method ID Data**

**EXAMPLE 1**—The following illustrates the message format for when there are more than one proprietary method to report.

Given:

a = Manufacturer Code  
b = Method ID

Message form is as follows: a,b,a,b,a,b,a,b, ....etc. In this example, the transport protocol of SAE J1939-21 has to be used to send the information because it requires more than 8 data bytes. Actually any time there is more than two methods to report, the services of the transport protocol have to be used.

## PGN 52992 – Continuous Torque & Speed Limit Request

The TSC1 message allows J1939 network devices to temporarily control engine and retarder speed and torque. This approach allows engine (and retarder) speed to be controlled by one device for a limited period of time. This may need to happen for brief emergency conditions (as requested by an anti-lock braking system for example) or in order to synchronize engine speed with some other device such as a transmission in order to allow a shift. Conflicting speed and torque requests from different devices are resolved by a predefined arbitration scheme.

Not every torque or speed need is satisfactorily addressed by this plan, however. Occasionally a network device may wish to impose longer lasting limits on speed and torque. For instance, as long as a transmission is in third gear, it may not be able to withstand all the torque the engine (or retarder) can produce. Or, an auxiliary device such as a pump may only operate correctly if engine speed and torque are kept within some fairly limited range *but not necessarily at one precise speed/torque!* In these cases, the network device does not need to command the precise speed or torque, but does have a legitimate desire to keep it within some boundary for an extended period of time. The TSC1 message doesn't provide this ability.

How: The ECM and retarder controller(s) first must define a "window" within the torque map. The window should be chosen carefully, and shouldn't be any larger than necessary. Any requests for continuous limits that attempt to intrude on this window will succeed only in setting limits at the very threshold of the window. For example, if the ECM declares that minimum continuous torque limits must be less than 900 lb-ft, and some device attempts to set a minimum continuous torque of 1000 lb-ft, the actual applied continuous limit will be 900 lb-ft (thus 900 lb-ft is the *minimum continuous* torque). When this limit is applied, the engine will always produce at least 900 lb-ft of torque. Similarly, if the engine declares that minimum continuous engine speed cannot be more than 1100 RPM, any attempts at setting a minimum continuous engine speed of over 1100 RPM will result in a minimum continuous engine speed of 1100 RPM. That is, the engine has declared beforehand that it will *always* be able to operate at least at 1100 RPM.

Periodically, the ECM and retarder controller(s) will transmit the dimensions of this window, as well as what actual continuous limits have been applied. This allows the engine to adjust the size and shape of the "window" to allow for derates and provides feedback to the various devices requesting continuous torque and/or speed limits.

The following figure shows an example torque curve with a "window" inside.

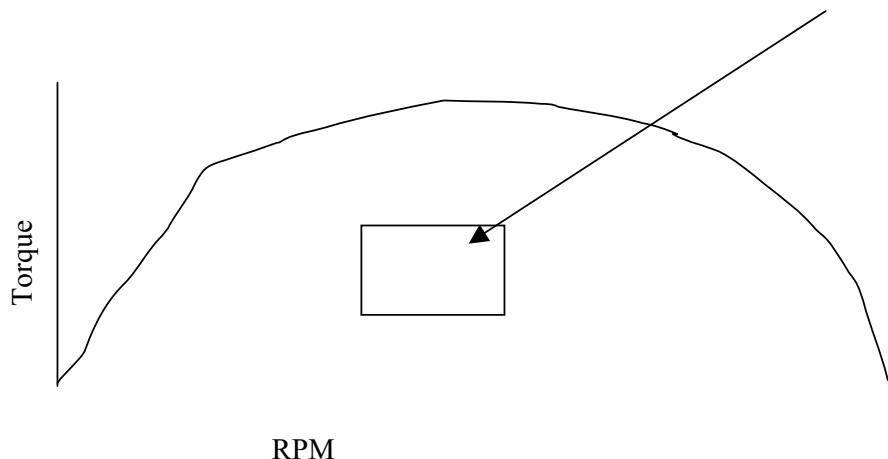


FIGURE PGN52992\_A

The following figure shows how the ECM will treat requests that are outside of the bounds set by the “window.” Note that the ECM has declared a “maximum allowable minimum” and a “minimum allowable maximum” for both speed and torque. These limits form a sort of rectangular “window” within the torque. The engine **must** be free to operate within this window; no continuous limits will be accepted that would intrude on it. In the diagram, some network device has ignored those values and attempted to set a minimum continuous speed higher than allowed. Remember, a minimum continuous speed means that the engine must always maintain an RPM of that value or greater. The ECM cannot accept the requested limit, so it applies a continuous limit as close as possible: right at the boundary set by “maximum value allowed for minimum continuous speed.” Requests for Minimum Continuous Speed and Max/Min continuous torque are handled the same way.

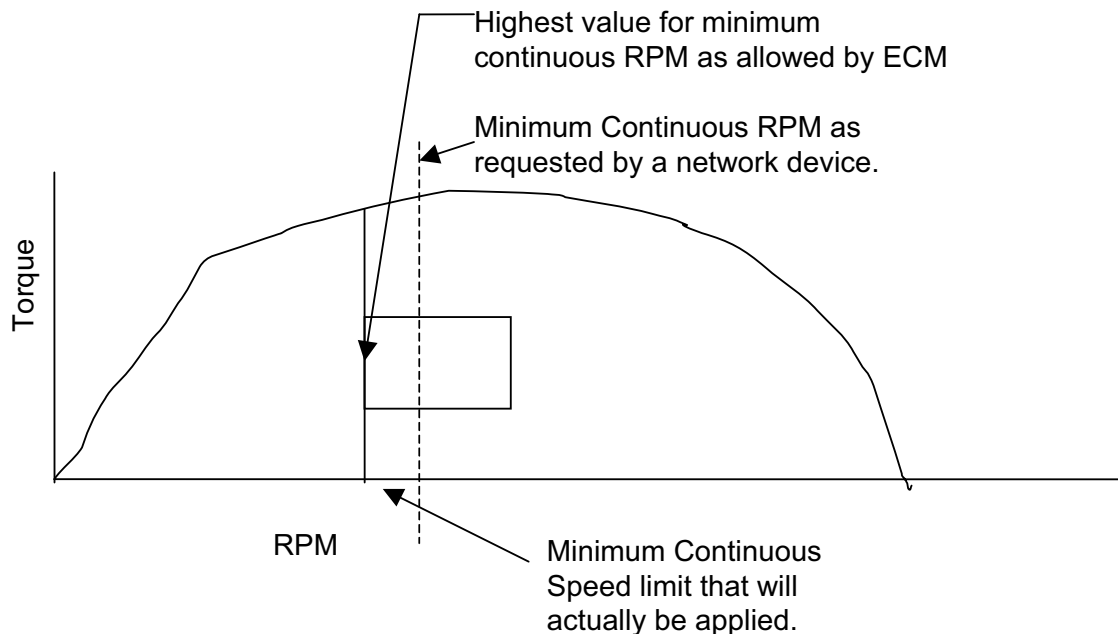


FIGURE PGN52992\_B

Things get a little more complicated when a retarder is included. Fortunately, only the engine compression brake retarder has any real relationship to the engine's torque map. Because other retarders may work against the engine, only the compression brake is generally controlled by the same ECU. For this reason, we must give it more careful attention.

The following figure illustrates one of the problems. Suppose continuous limits have been applied to the engine and retarder as indicated by the rectangular boxes within the torque maps. If the engine is prohibited from allowing torque to decrease below  $x$ , how can the retarder be engaged? An engine compression brake retarder needs zero fueling for the engine in order to engage. The simple answer is that if there is a minimum continuous torque limit applied to the engine, the retarder will not be engaged.

How does the reverse case behave? If the retarder is of a type other than engine compression brake, it may work against the engine and continuously produce a negative torque. Engine compression brake retarders must not send out a list of acceptable limits that would allow such conundrums. In practical terms, this means that engine compression brake retarders must set their Maximum Continuous Torque limit (think of it as MINIMUM continuous BRAKING torque limit) to zero in order for the retarder to ever be engaged. Similarly, the continuous limits as actually applied to the engine must allow zero torque if the retarder is to be engaged.



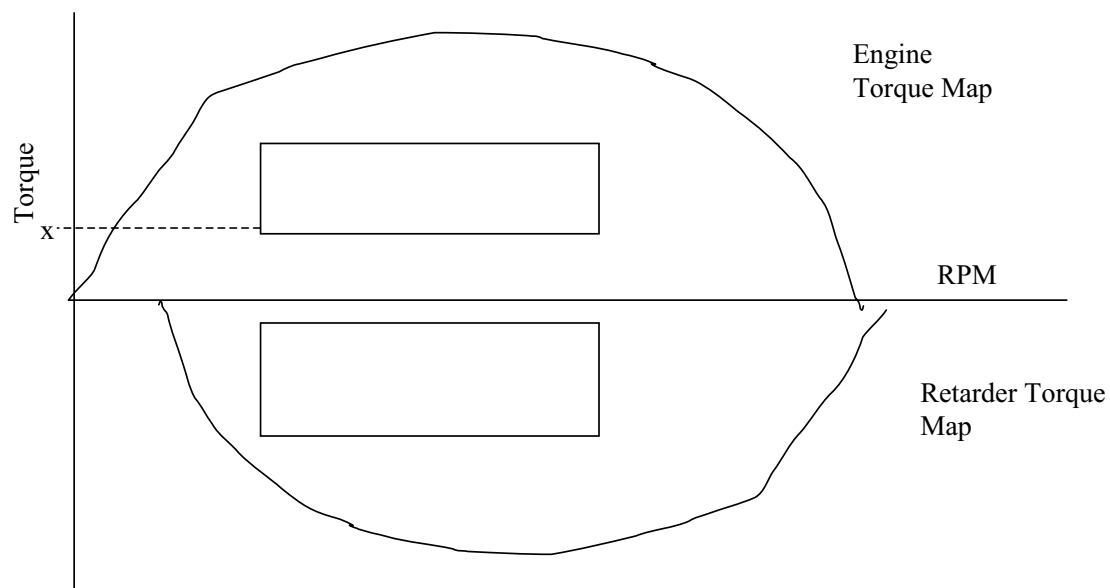


FIGURE PGN52992\_C

## PGN 56320 – Anti-Theft Status

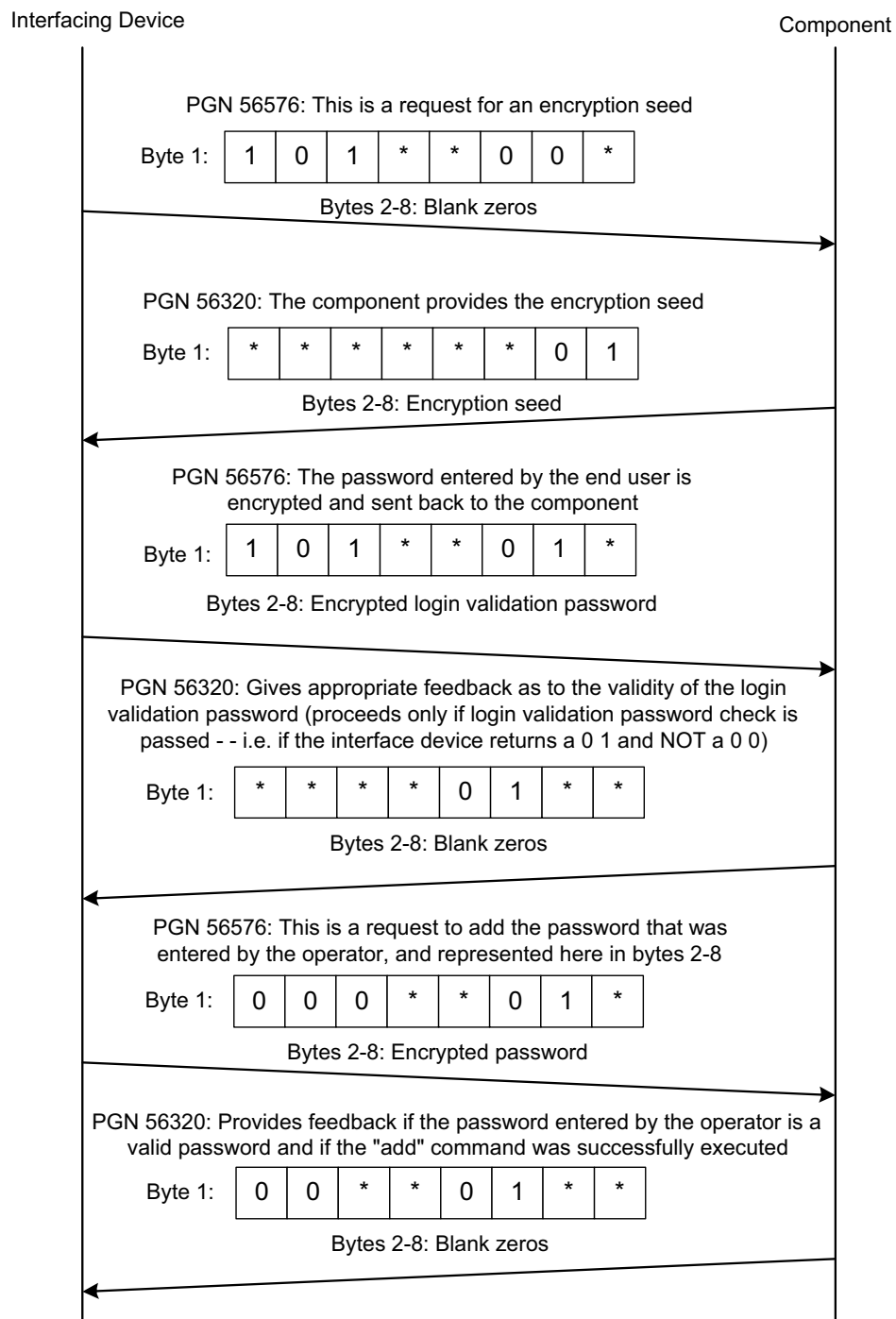


FIGURE PGN56320\_A - OPERATOR DESIRES TO ADD A PASSWORD TO THE  
COMPONENT'S PASSWORD STRUCTURE

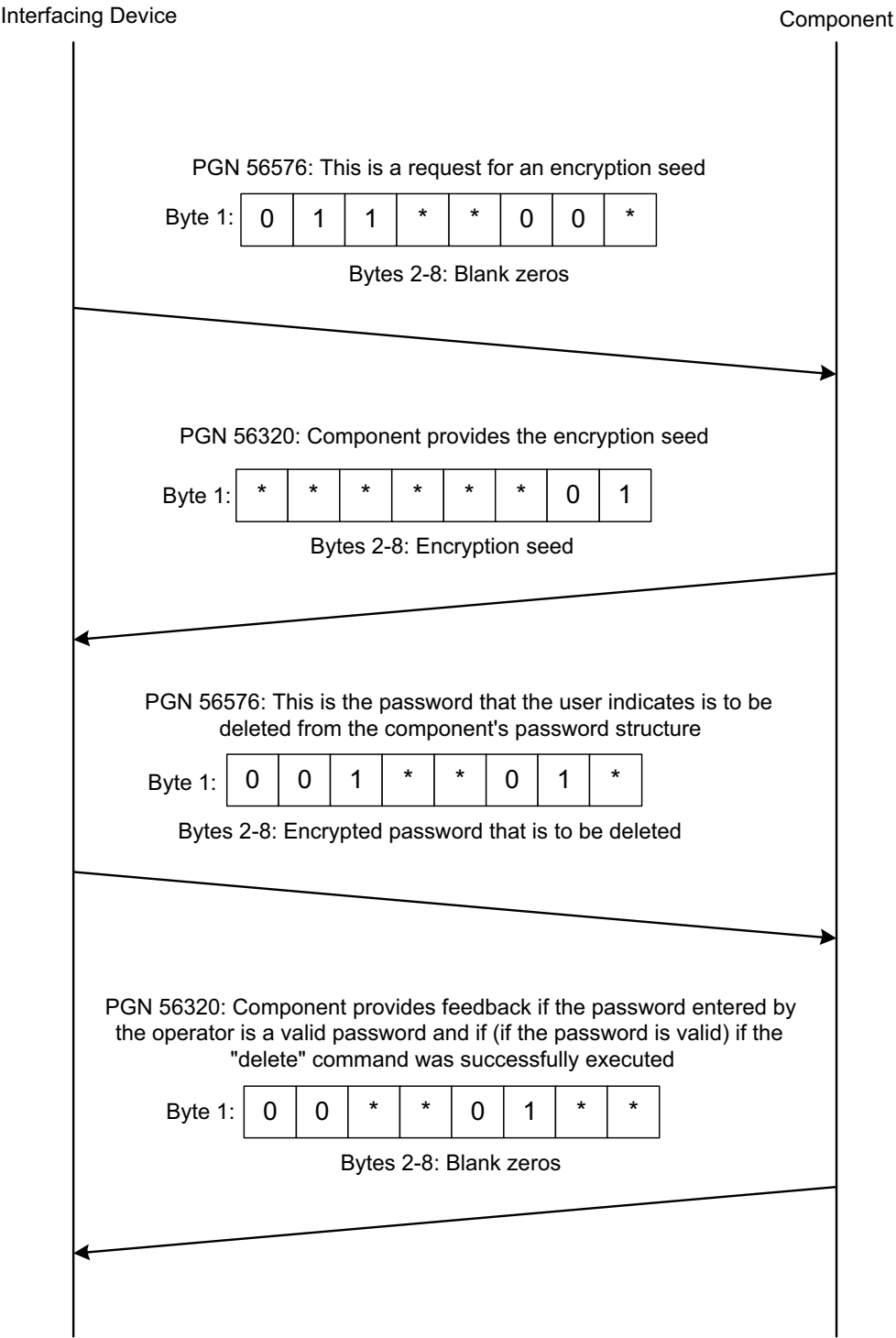


FIGURE PGN56320\_B—OPERATOR DESIRES TO DELETE A PASSWORD FROM THE COMPONENT’S PASSWORD STRUCTURE

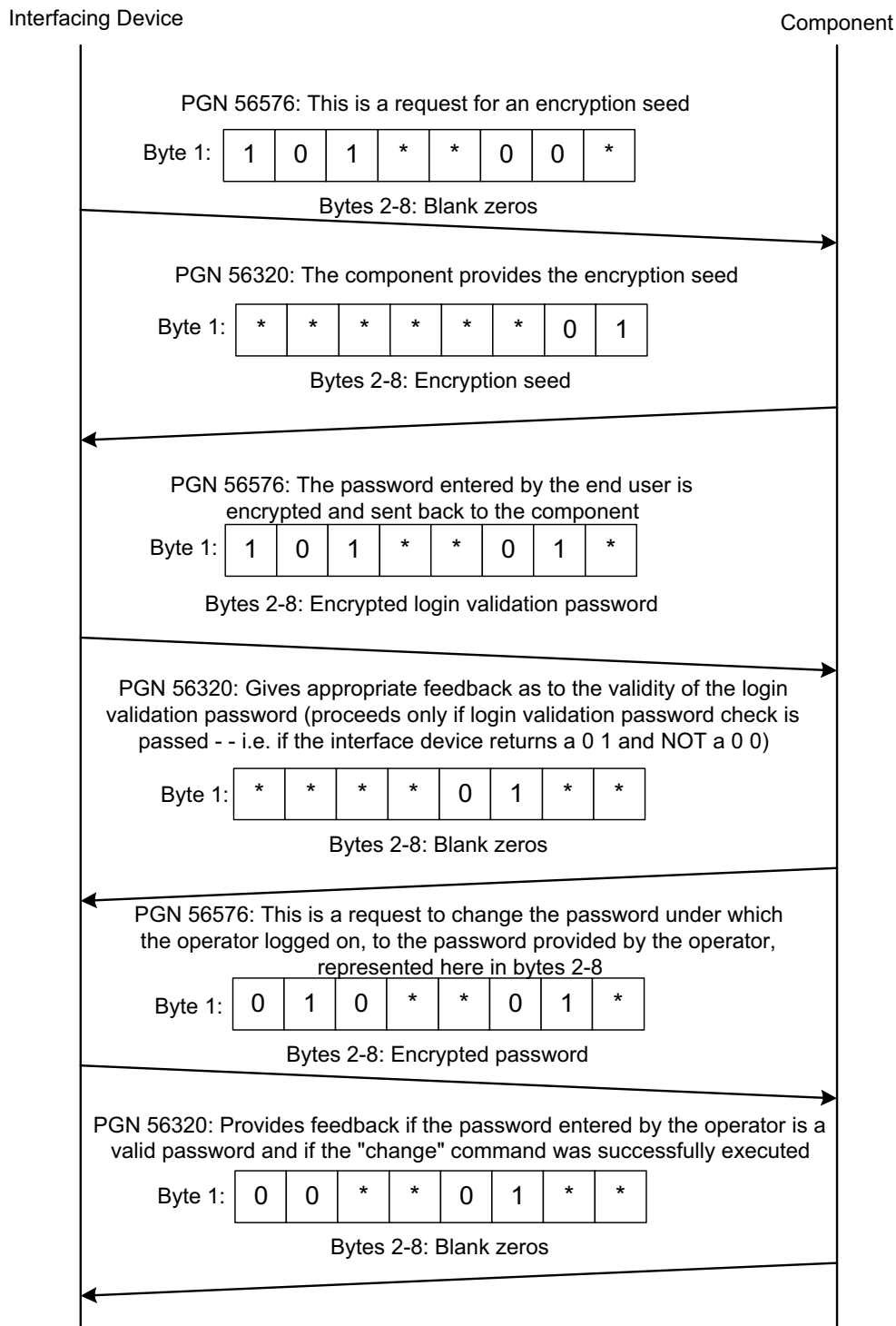


FIGURE PGN56320\_C—OPERATOR DESIRES TO CHANGE A PASSWORD WITHIN THE COMPONENT'S PASSWORD STRUCTURE

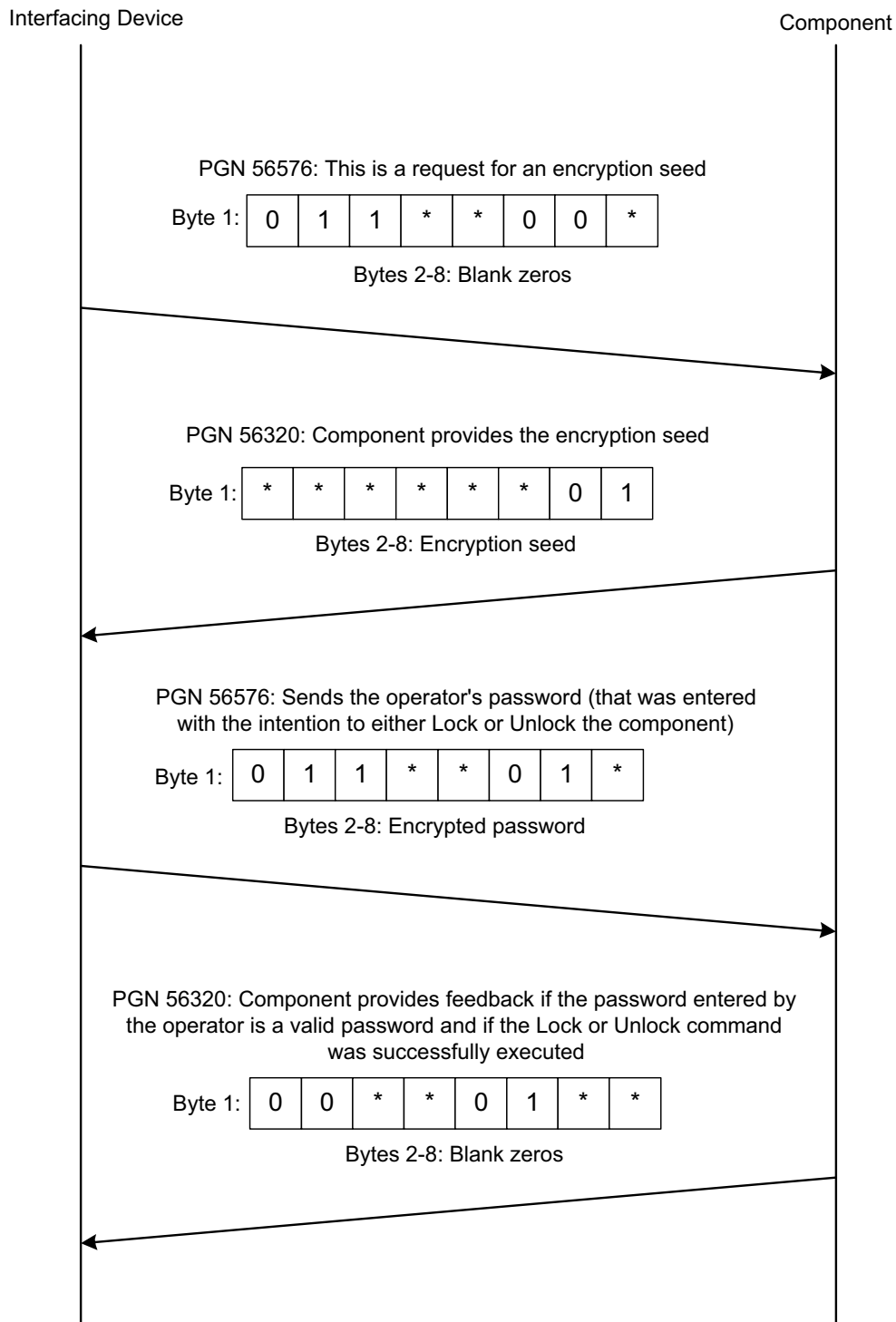


FIGURE PGN56320\_D—OPERATOR DESIRES TO LOCK OR UNLOCK THE COMPONENT

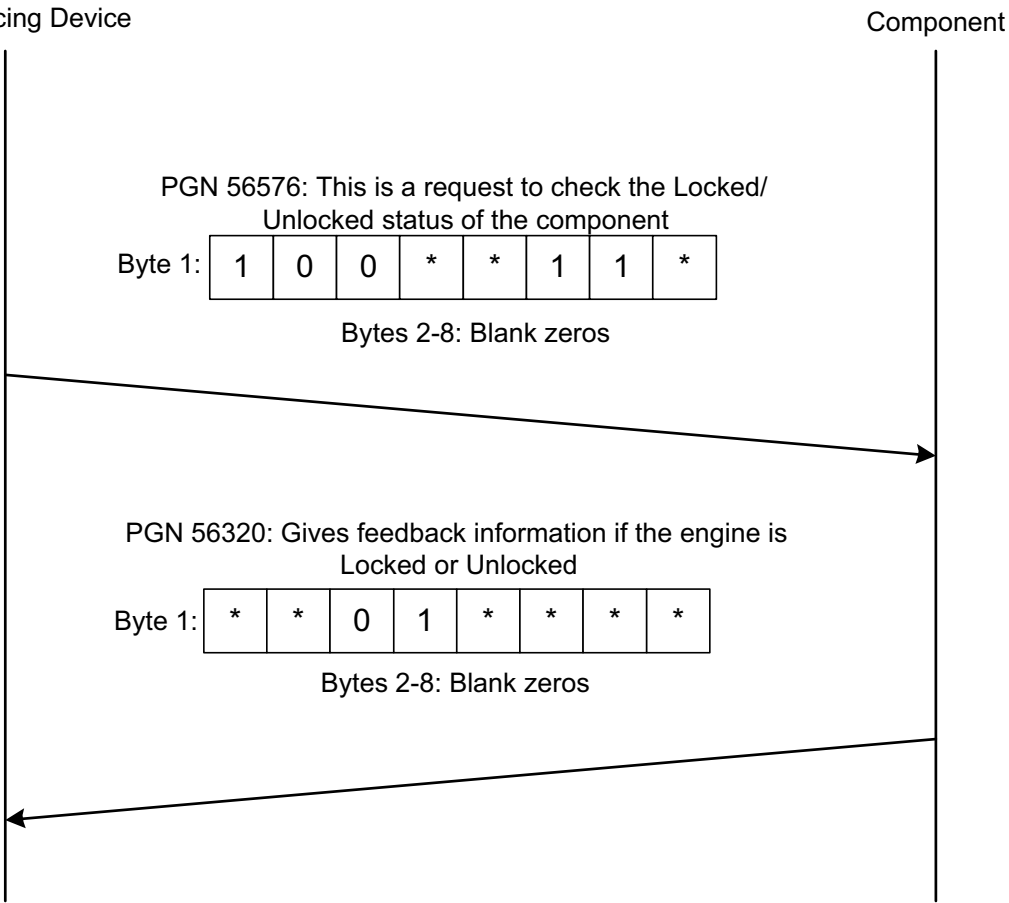


FIGURE PGN56320\_E—CHECKING STATUS OF THE COMPONENT

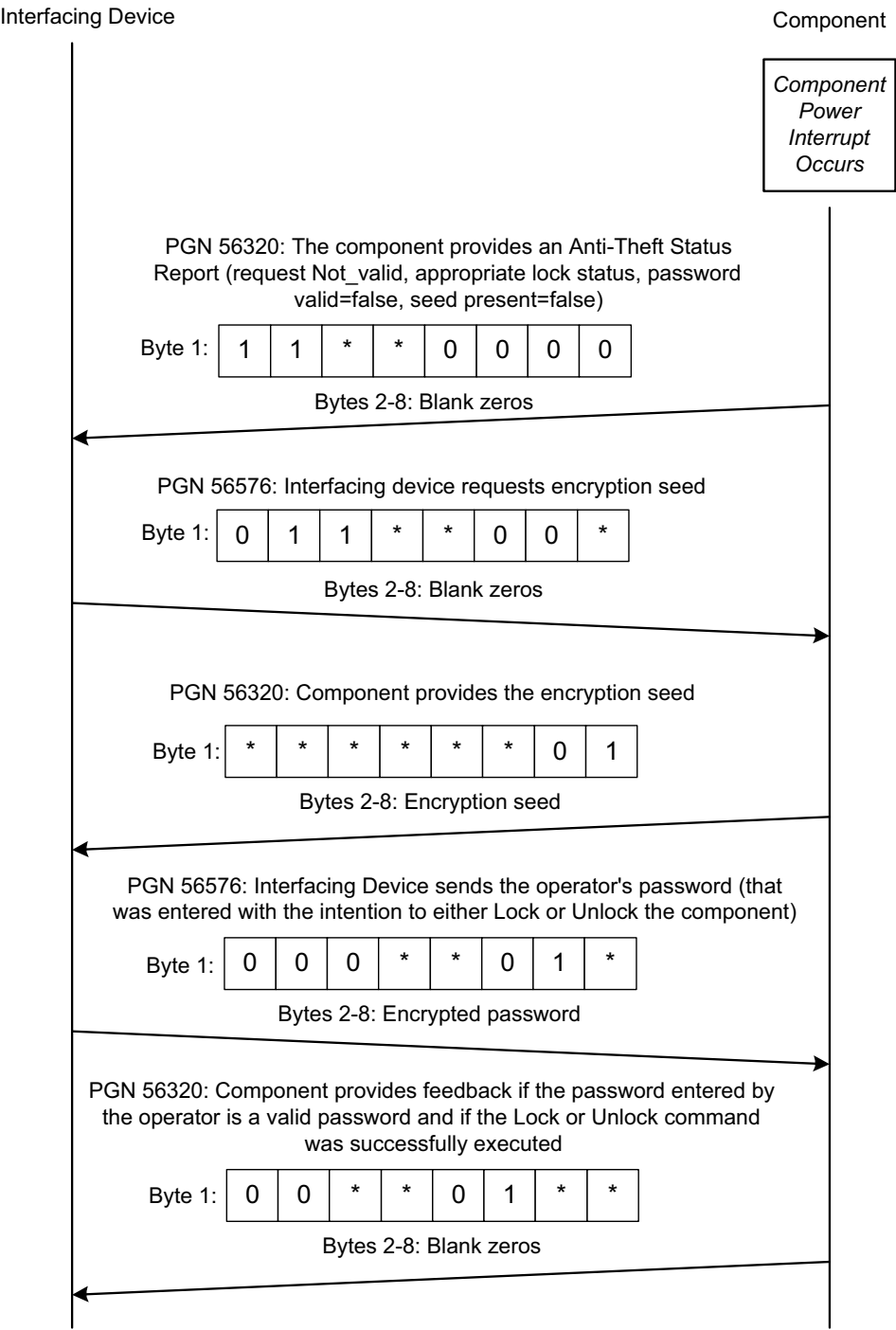


FIGURE PGN56320\_F—ABNORMAL COMPONENT POWER INTERRUPTION  
(INTERFACING DEVICE POWER IS NOT INTERRUPTED)

## PGN 61459 – Slope Sensor Information

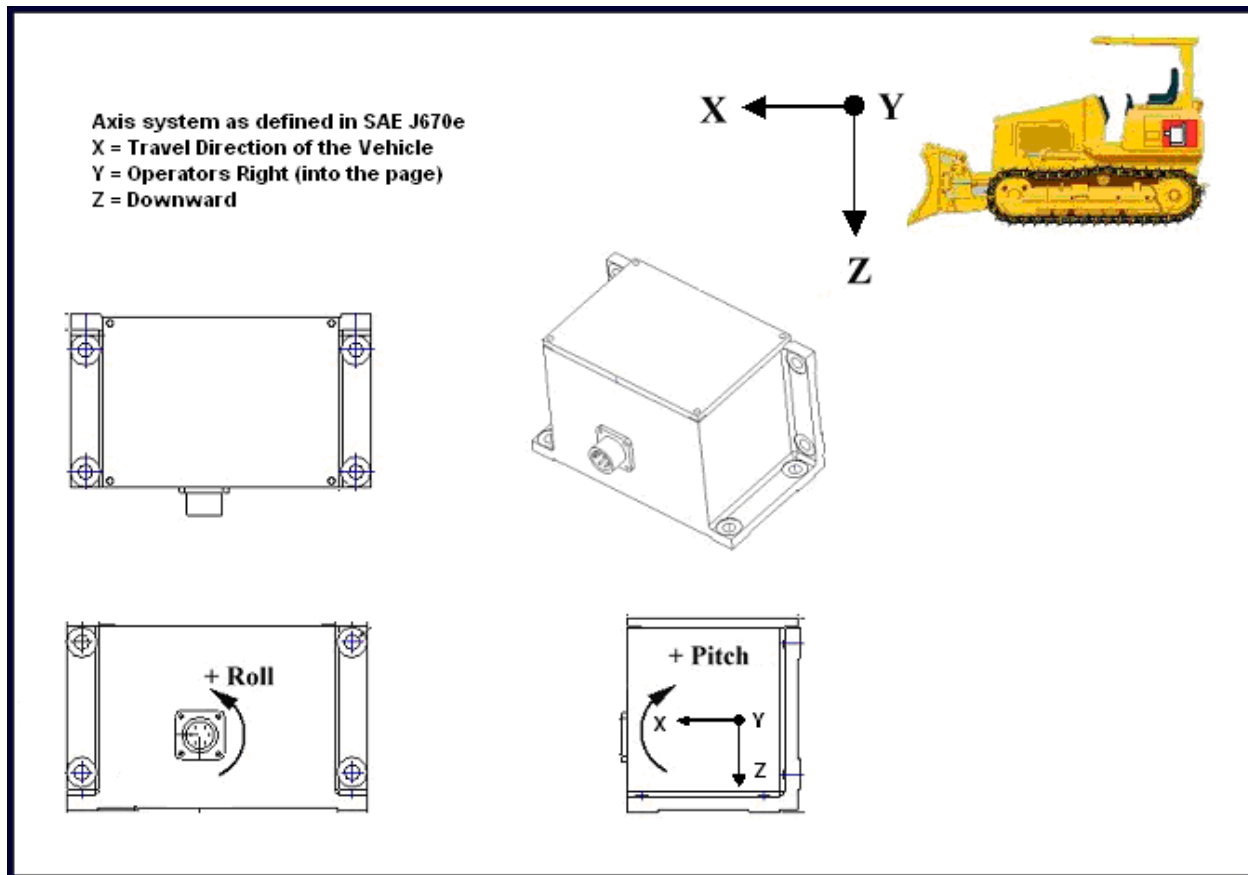


FIGURE PGN61459\_A—SLOPE SENSOR ORIENTATIONS



## PGN 61466 – Engine Throttle / Fuel Actuator Control Command

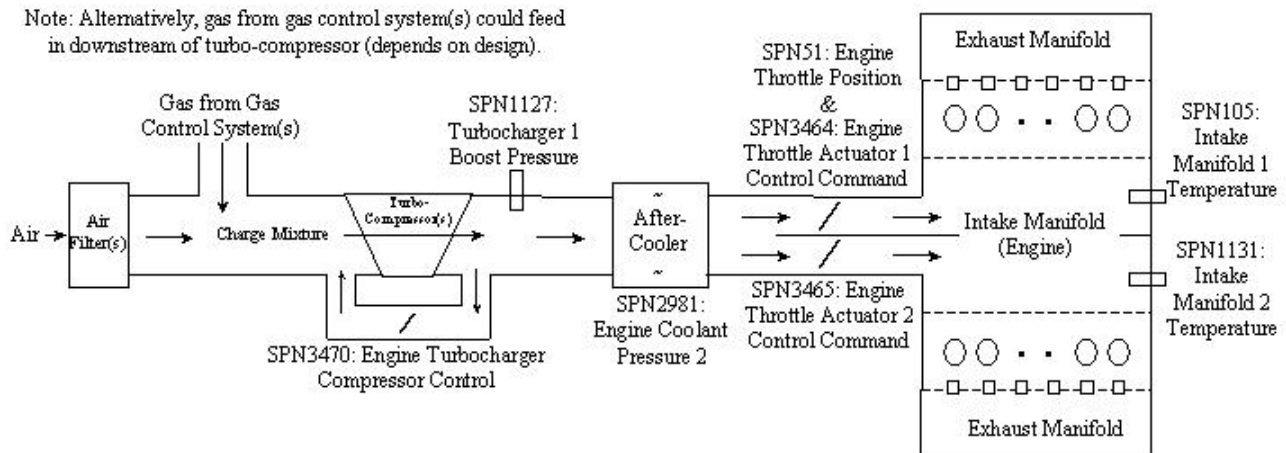
**Air Handling Systems**

FIGURE PGN61466\_A – AIR HANDLING SYSTEMS

**PGN 64839 – Transmission Mode Labels**

Conveys ASCII 'labels' for each of the manufacturer-specified TC1 Transmission Mode 'x' / ETC7 Transmission Mode Indicator 'x' pairs. Intended for use with on-board or service tool displays. There are up to 8 fields (for Transmission Mode 1 through Transmission Mode 8), and each is separated by an ASCII asterisk delimiter "\*". It is not necessary to include all fields; however, the delimiter is always required.

Data byte arrangement  $a_1...a_x * a_1...b_x * c_1...c_x * d_1...d_x * e_1...e_x * f_1...f_x * g_1...g_x * h_1...h_x$

...where, if applicable:

|                       |                                                  |
|-----------------------|--------------------------------------------------|
| $a_1 \rightarrow a_x$ | Transmission Mode Label, for Transmission Mode 1 |
| ASCII *               | Delimiter                                        |
| $b_1 \rightarrow b_x$ | Transmission Mode Label, for Transmission Mode 2 |
| ASCII *               | Delimiter                                        |
| $c_1 \rightarrow c_x$ | Transmission Mode Label, for Transmission Mode 3 |
| ASCII *               | Delimiter                                        |
| $d_1 \rightarrow d_x$ | Transmission Mode Label, for Transmission Mode 4 |
| ASCII *               | Delimiter                                        |
| $e_1 \rightarrow e_x$ | Transmission Mode Label, for Transmission Mode 5 |
| ASCII *               | Delimiter                                        |
| $f_1 \rightarrow f_x$ | Transmission Mode Label, for Transmission Mode 6 |
| ASCII *               | Delimiter                                        |
| $g_1 \rightarrow g_x$ | Transmission Mode Label, for Transmission Mode 7 |
| ASCII *               | Delimiter                                        |
| $h_1 \rightarrow h_x$ | Transmission Mode Label, for Transmission Mode 8 |

EXAMPLE – Delimiter use when label support varies:

aaaaaaaa\*bbbbbbbbbb\*\*\*\*\*

\*bbbbbbbb\*\*\*\*\*

\*bbbbbbbb\*\*dddd\*\*\*\*

EXAMPLE – A transmission supporting a 'NORMAL' operating mode in Transmission Mode 1, and a 'PLOW' mode in Transmission Mode 2 might send:

|            |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Data Byte: | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  | 12  | 13  | 14  | 15  | 16  | 17  |
| Decimal    | 78  | 79  | 82  | 77  | 65  | 76  | 42  | 80  | 76  | 79  | 87  | 42  | 42  | 42  | 42  | 42  | 42  |
| ASCII:     | 'N' | 'O' | 'R' | 'M' | 'A' | 'L' | '*' | 'P' | 'L' | 'O' | 'W' | '*' | '*' | '*' | '*' | '*' | '*' |

**PGN 64906 – SAE J2012 DTC Display**

Conveys basic SAE J2012 DTC information for on-board or service tool displays.

Data byte arrangement: A B<sub>1</sub> B<sub>2</sub> B<sub>3</sub> B<sub>4</sub> B<sub>5</sub> C<sub>1</sub> B<sub>1x</sub> B<sub>2x</sub> B<sub>3x</sub> B<sub>4x</sub> B<sub>5x</sub> C<sub>x</sub> . . .

...where:

| Data Byte       | Definition                                                      |
|-----------------|-----------------------------------------------------------------|
| A               | Number of J2012 DTCs                                            |
| B <sub>1x</sub> | 1 <sup>st</sup> Character of J2012 DTC x                        |
| B <sub>2x</sub> | 2 <sup>nd</sup> Character of J2012 DTC x                        |
| B <sub>3x</sub> | 3 <sup>rd</sup> Character of J2012 DTC x                        |
| B <sub>4x</sub> | 4 <sup>th</sup> Character of J2012 DTC x                        |
| B <sub>5x</sub> | 5 <sup>th</sup> Character of J2012 DTC x                        |
| C <sub>x</sub>  | Bit 8: J2012 DTC Status<br>Bits 7-1: J2012 DTC Occurrence Count |

If PGN 64906 is requested and a supporting device has no active or inactive J2012 DTCs, PGN 64906 shall be sent as a single frame message with the first data byte (*Number of J2012 DTCs*) set to zero. When two or more J2012 DTCs are indicated, PGN 64906 must be sent via Transport Protocol (See J1939-21).

EXAMPLE – A device conveying (1) an active P1482 with 9 counts and (2) an inactive U0100 with 4 counts would populate the data bytes as follows:

| Data Byte: | 1  | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  | 12  | 13 |
|------------|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|
| Decimal    | 2  | 80  | 49  | 52  | 56  | 50  | 137 | 85  | 48  | 49  | 48  | 48  | 4  |
| ASCII:     | -- | 'P' | '1' | '4' | '8' | '2' | --  | 'U' | '0' | '1' | '0' | '0' | -- |

### PGN 64912 – Advertised Engine Torque Curve

This map conveys the advertised torque curve for the engine, as typically seen on specification sheets available from most engine manufacturers. The collection conditions for the data conveyed are indicated by SPN 3558 – AETC Data Collection Standard.

This map does not contain dynamic elements, and does not change during engine operation. For engines capable of dynamically switching between torque curves or ratings during operation, this map contains values for the highest (most powerful) rating. This map is not intended for use in real time engine control, but merely to indicate what engine rating is installed in the vehicle.

Data points on the curve are in order from left to right, and, at a minimum, must span from the lowest rpm where peak torque can be produced to the high speed governor breakpoint. SPN 3559 – Number of AETC Data Points indicates the number of data points being sent. A minimum of 5 points must be supported, with up to 15 available as needed to properly convey the shape of the torque curve. As illustrated below, speed values need not be evenly incremented.

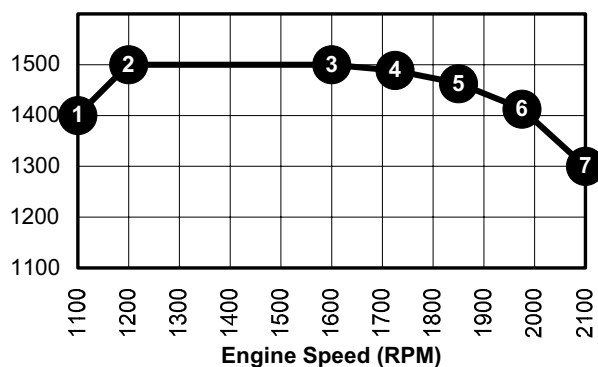


FIGURE PGN64912\_A – ADVERTISED ENGINE TORQUE CURVE

## PGN 64932 – PTO Drive Engagement

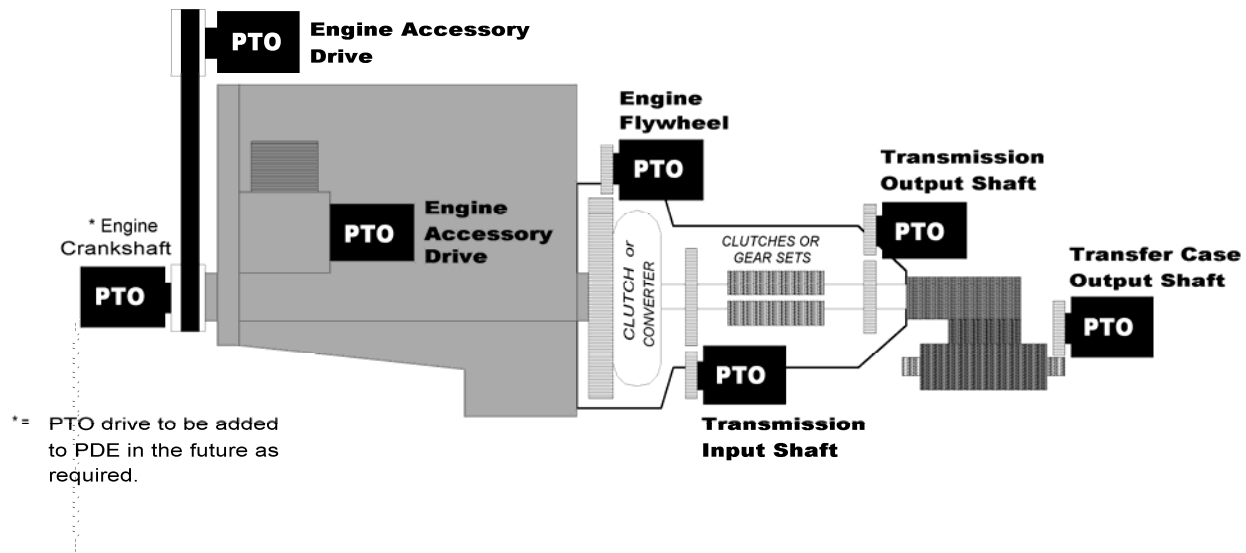


FIGURE PGN64932\_A – PTO DRIVE ENGAGEMENT LOCATIONS

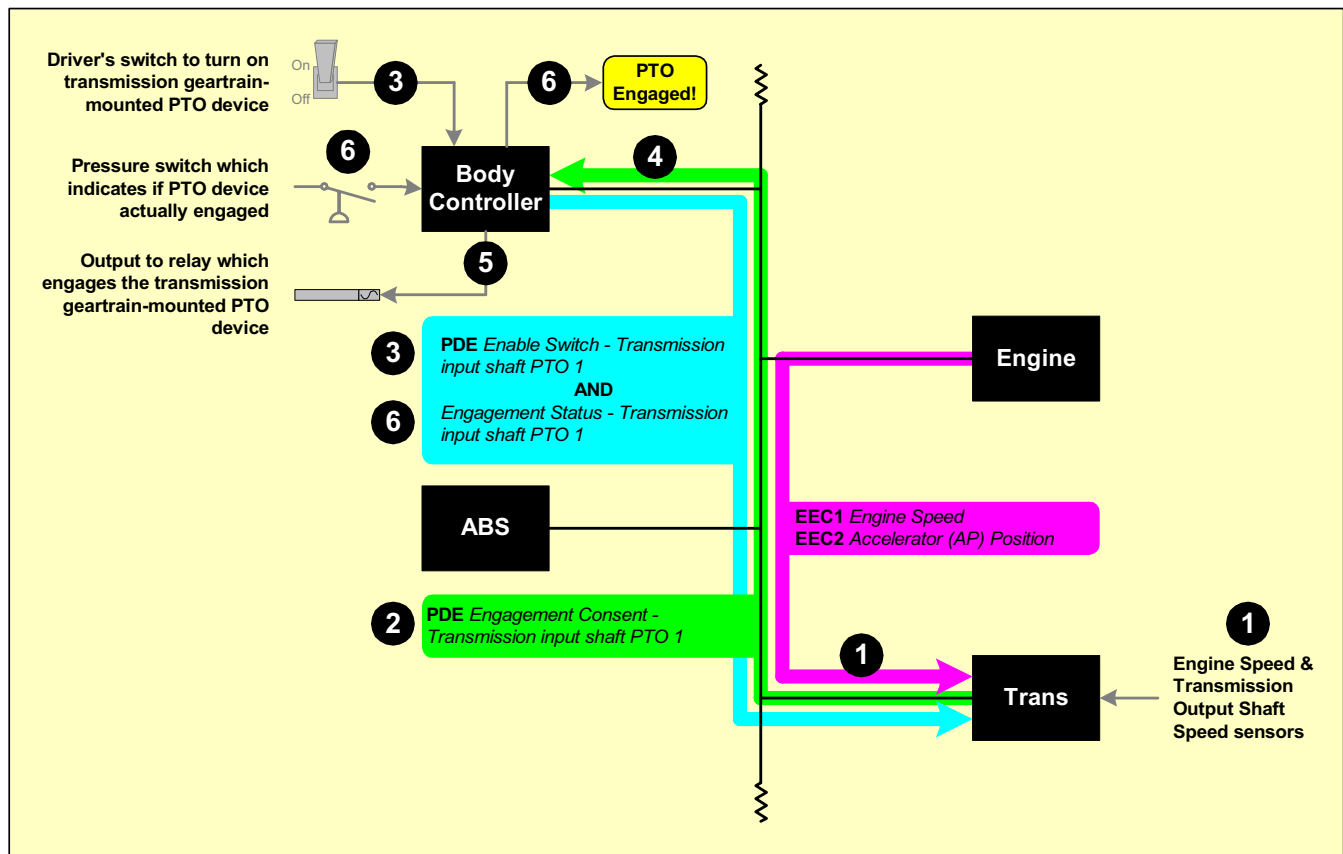


FIGURE PGN64932\_B – VEHICLE OEM CONTROLLER INTERFACES WITH ALL PTO WIRING

More ideal from an OEM standpoint, as they no longer need any specialized PTO wiring for different makes of transmissions.

1. The transmission continually monitors the conditions it requires before its PTO drive can be engaged. This may include internal sensors as well as data collected from the network, such as throttle position.
2. Regardless of whether the operator has requested PTO engagement, the 'engagement consent' status is continually broadcast by the transmission.
3. The operator turns on the cab switch to activate the PTO device mounted on the transmission. The Body Controller reflects this switch status in its PDE message broadcast; the transmission or other devices on the network may choose to use this information in their control logic.
4. Among its conditions and inputs required before engaged the PTO drive, the Body Controller checks the 'consent' status broadcast from the transmission.
5. If conditions are acceptable, the Body Controller power the circuit to engage the PTO mounted on the transmission.
6. The Body Controller monitors the progress of the physical PTO engagement, and reflects this in its PDE broadcast so that other on the network may use the information.
7. The Body Controller continues to monitor the transmissions 'consent' broadcast, and disengages the PTO if at any time the transmission rescinds its consent.

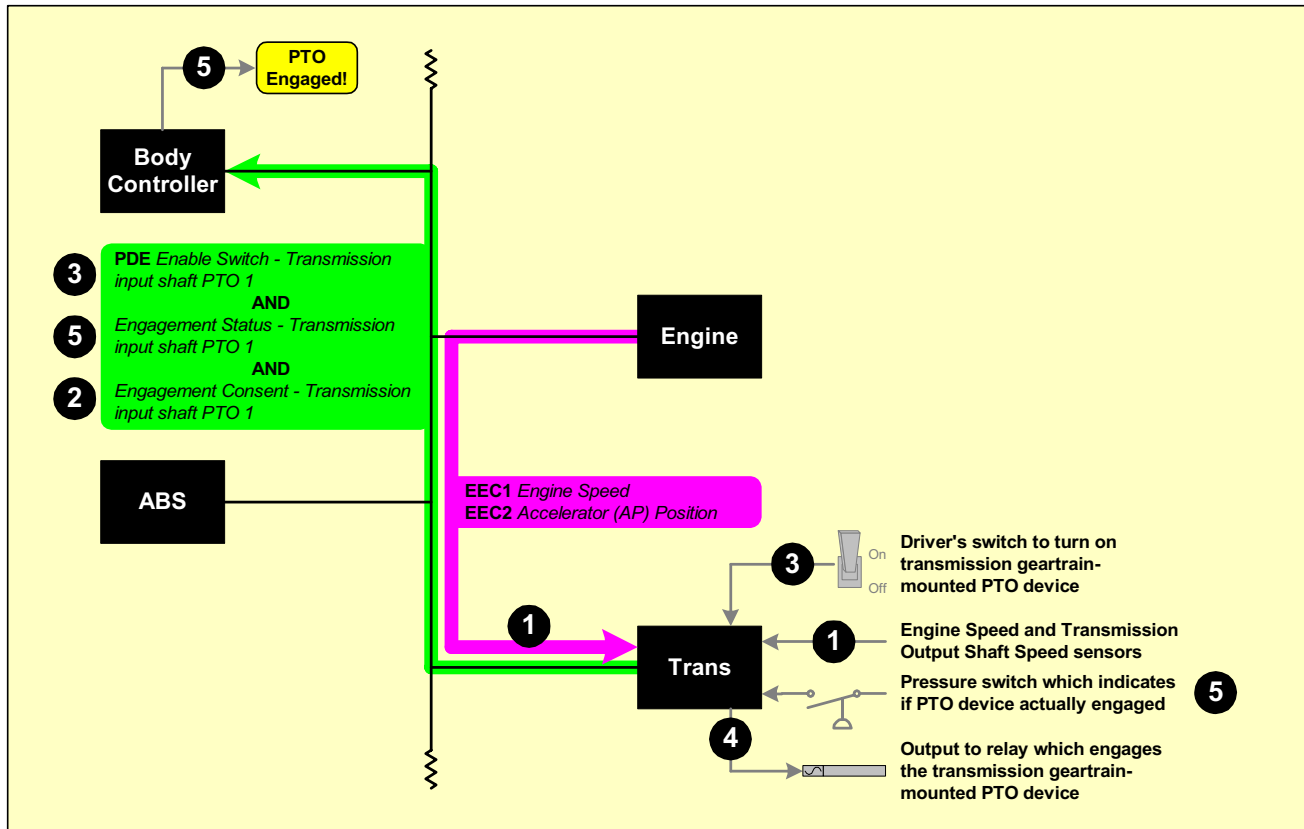


FIGURE PGN64932\_C – COMPONENT DRIVING PTO INTERFACES WITH ALL PTO WIRING

This arrangement might be better suited for small OEMs who would rather not deal with figuring out the PTO wiring.

The key point is that the proposed PTO Engagement message structure would adapt to either configuration. Note that the Body Controller broadcasts no new messages; only the transmission sends the PDE message.

1. The transmission continually monitors the conditions it requires before its PTO drive can be engaged. This may include internal sensors as well as data collected from the network, such as throttle position.
2. Regardless of whether the operator has requested PTO engagement, the 'engagement consent' status is continually broadcast by the transmission.
3. The operator turns on the cab switch to activate the PTO device mounted on the transmission. The Transmission Controller reflects this switch status in its PDE message broadcast; the Body Controller or other devices on the network may choose to use this information in their control logic.
4. If conditions are acceptable, the Transmission Controller power the circuit to engage the PTO mounted on the transmission.
5. The Transmission Controller monitors the progress of the physical PTO engagement, and reflects this in its PDE broadcast so that other on the network may use the information.

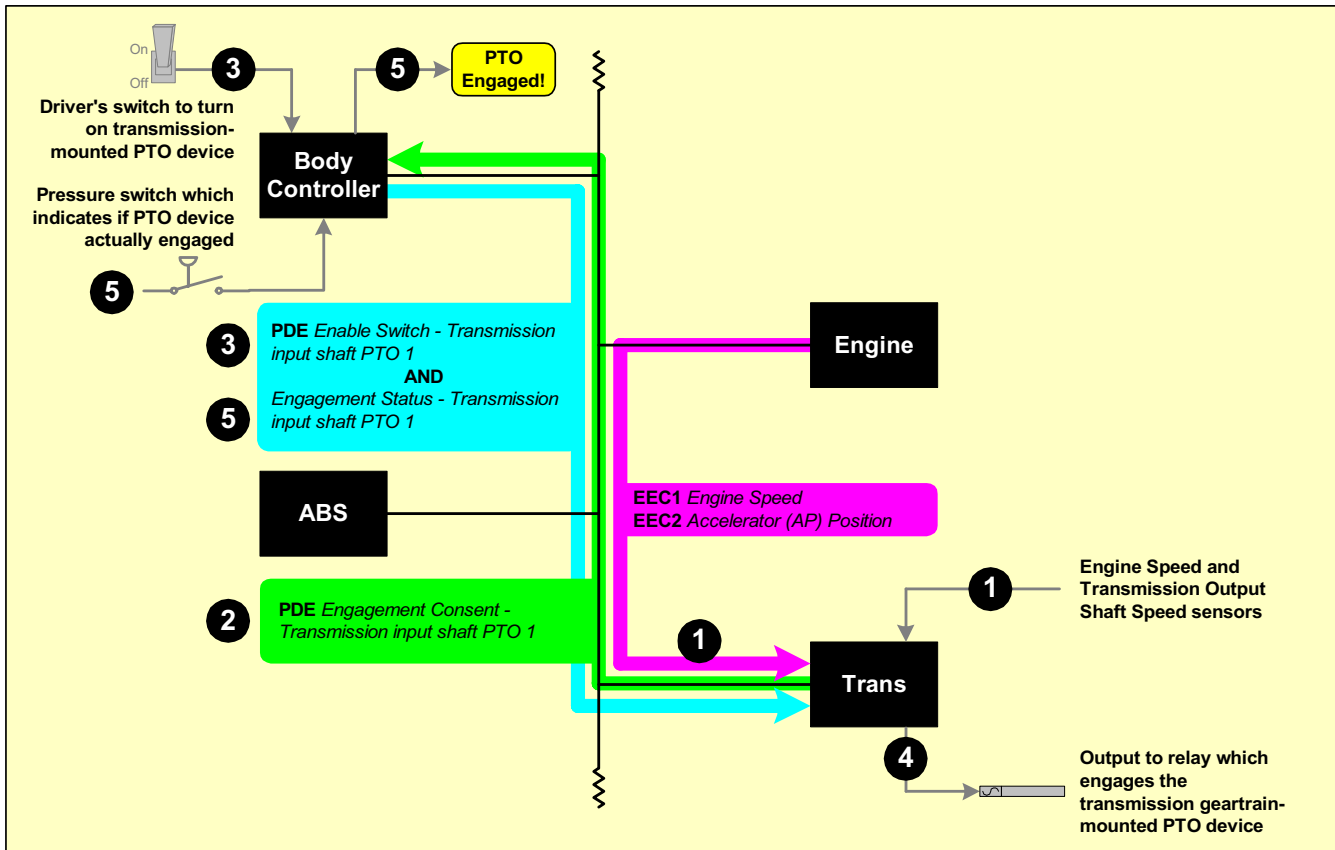


FIGURE PGN64932\_D – DISTRIBUTED PTO INTERFACES WIRING

This arrangement is shown to illustrate the flexibility of the PDE messaging.

The various inputs are distributed among two or three controllers that are part of the PTO engagement system.

1. The transmission continually monitors the conditions it requires before its PTO drive can be engaged. This may include internal sensors as well as data collected from the network, such as throttle position.
2. Regardless of whether the operator has requested PTO engagement, the 'engagement consent' status is continually broadcast by the transmission.
3. The operator turns on the cab switch to activate the PTO device mounted on the transmission. The Body Controller reflects this switch status in its PDE message broadcast; the Transmission Controller receives this input.
4. If conditions are acceptable, the Transmission Controller power the circuit to engage the PTO mounted on the transmission.
5. The Body Controller monitors the progress of the physical PTO engagement, and reflects this in its PDE broadcast so that other on the network may use the information.



## PGN 64938 – Engine Fluid, Level and Pressure 4

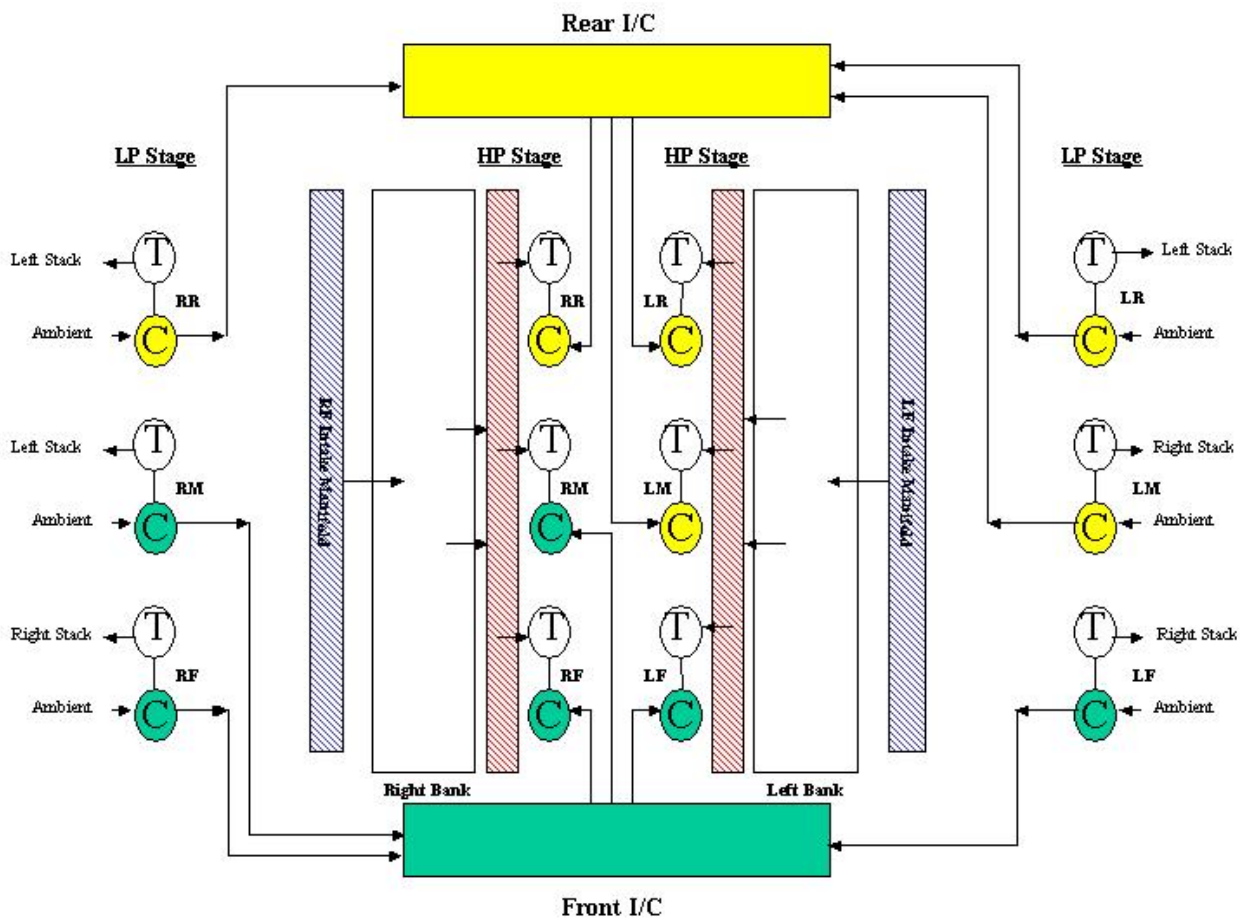
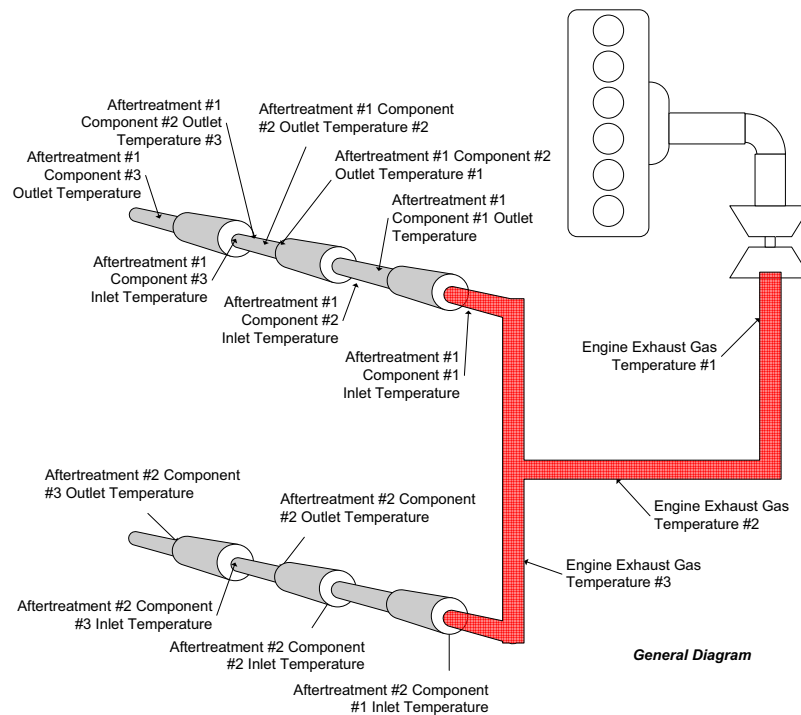


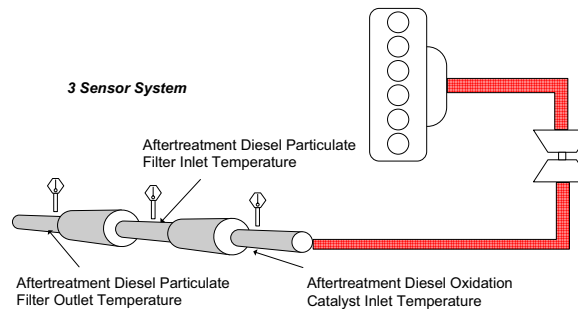
FIGURE PGN64938\_A – ENGINE CHARGE AIR COOLER PRESSURES

## PGN – Aftertreatment Systems

## General Diagram



## 3 Sensor System



## 4 Sensor System

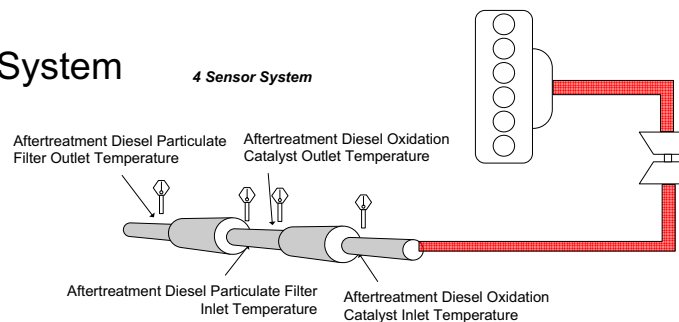
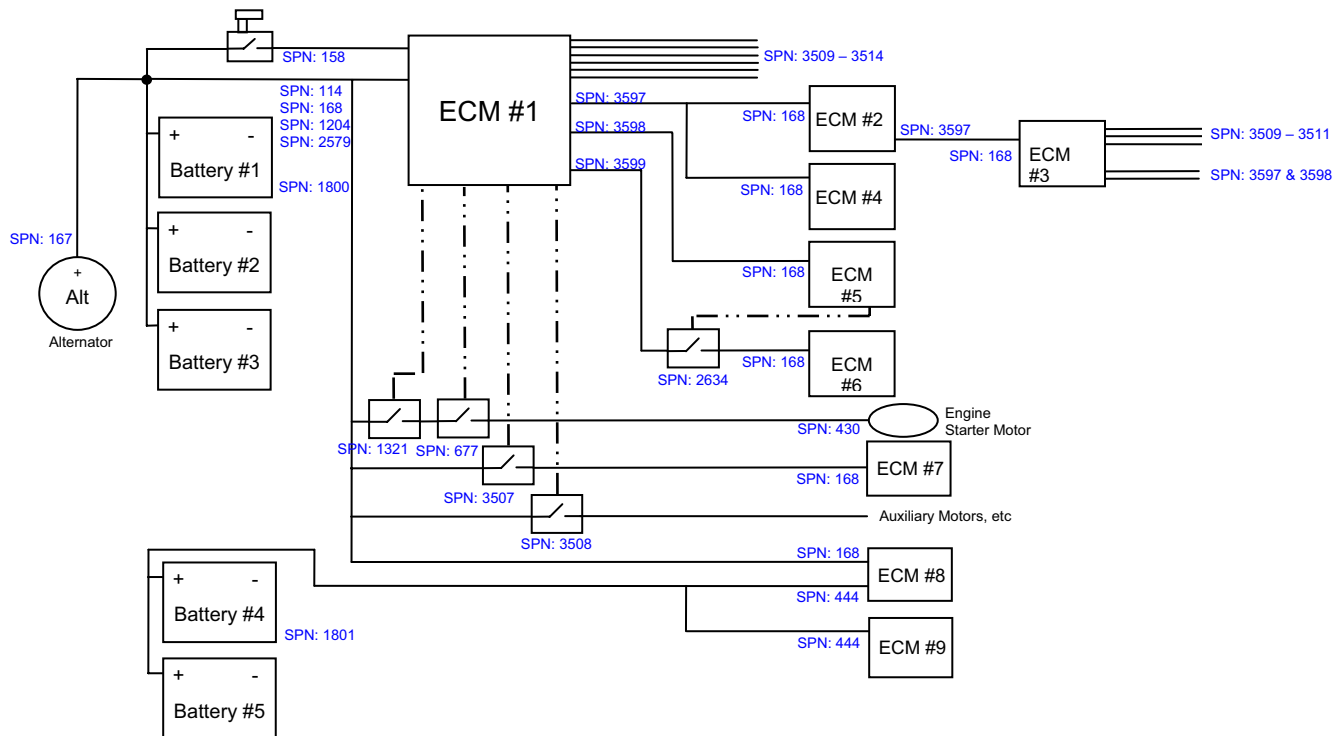


FIGURE PGN64948\_A – EXAMPLE AFTERTREATMENT SYSTEM CONFIGURATIONS

PGN 65104 – Battery Information



Note: The ECMs shown in this diagram could represent an ECM, or any intelligent device that is capable of diagnostics.

FIGURE PGN65104\_A – BATTERY INFORMATION

| SPN  | SPN Name                                             | SPN  | SPN Name                                    |
|------|------------------------------------------------------|------|---------------------------------------------|
| 114  | Net Battery Current                                  | 2579 | Net Battery Current (High Range/Resolution) |
| 115  | Alternator Current                                   | 2634 | Power Relay                                 |
| 158  | Keyswitch Battery Potential                          | 3507 | TECU ECU PWR Relay                          |
| 167  | Charging System Potential (Voltage)                  | 3508 | TECU PWR Relay                              |
| 168  | Battery Potential / Power Input 1                    | 3509 | Sensor Supply 1                             |
| 430  | Engine Starter Solenoid Voltage                      | 3510 | Sensor Supply 2                             |
| 444  | Battery Potential / Power Input 2                    | 3511 | Sensor Supply 3                             |
| 677  | Engine Starter Motor Relay                           | 3512 | Sensor Supply 4                             |
| 1204 | Electrical Load                                      | 3513 | Sensor Supply 5                             |
| 1321 | Engine Starter Solenoid Lockout Relay Driver Circuit | 3514 | Sensor Supply 6                             |
| 1795 | Alternator Current (High Range/Resolution)           | 3597 | ECU Power Output 1                          |
| 1800 | Battery 1 Temperature                                | 3598 | ECU Power Output 2                          |
| 1801 | Battery 2 Temperature                                |      |                                             |

FIGURE PGN65104\_B – BATTERY INFORMATION LEGEND

## PGN 65135 – Adaptive Cruise Control

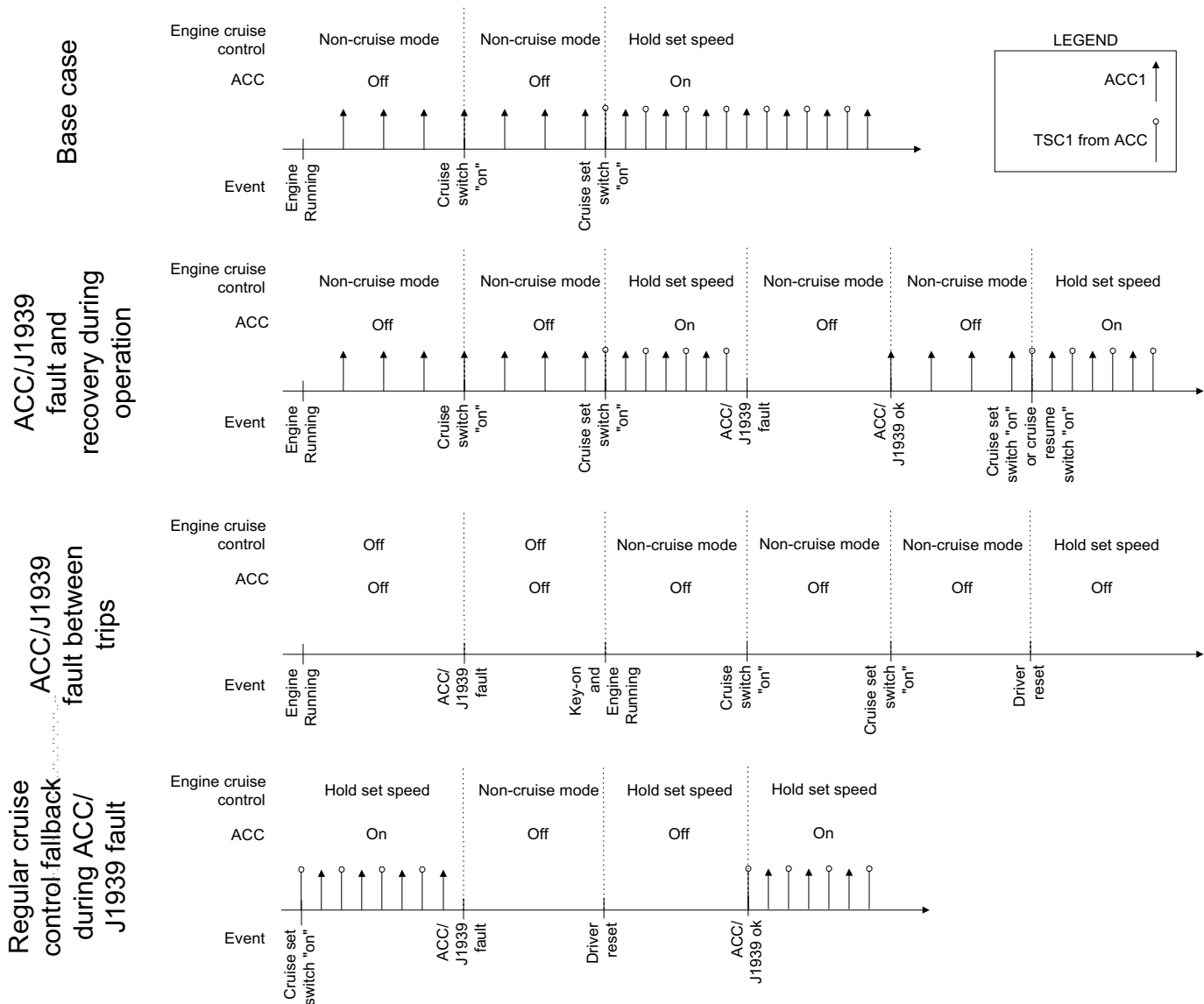


FIGURE PGN65135\_A – ADAPTIVE CRUISE CONTROL TIMING DIAGRAM

## PGN 65163 – Gaseous Fuel Pressure

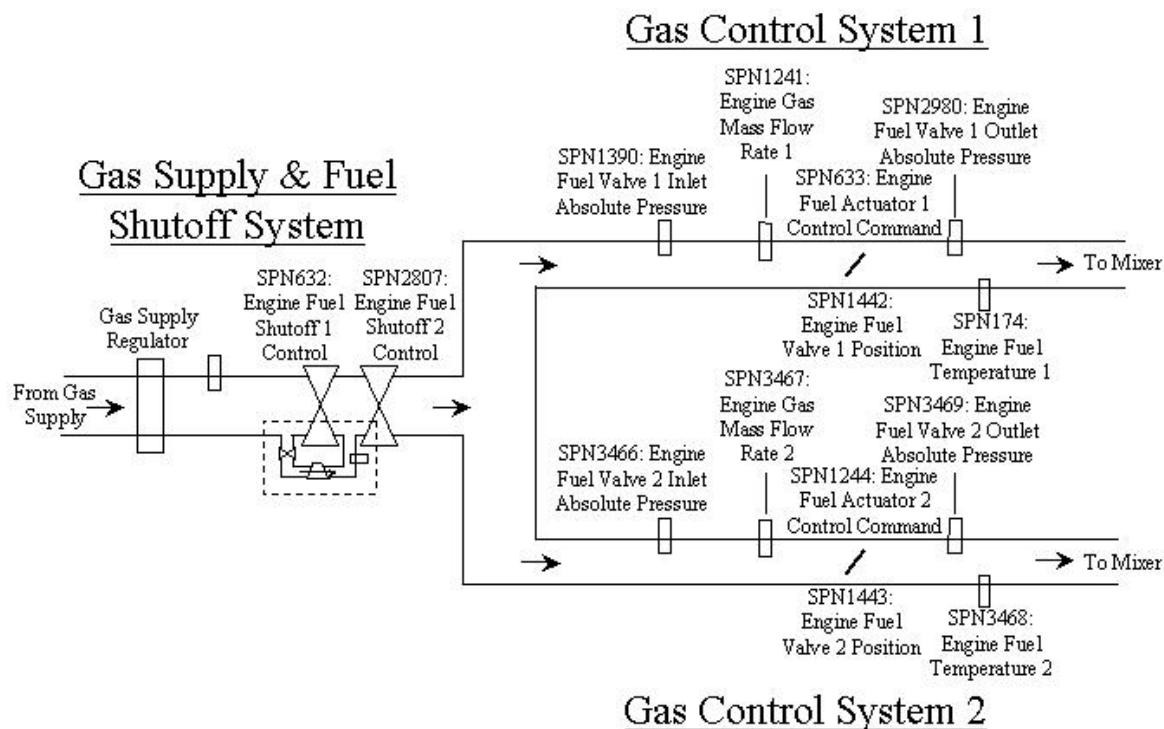
**Gas Supply and Control Systems**

FIGURE PGN65163\_A – GAS SUPPLY AND CONTROL SYSTEMS

PGN 65249 – Retarder Information

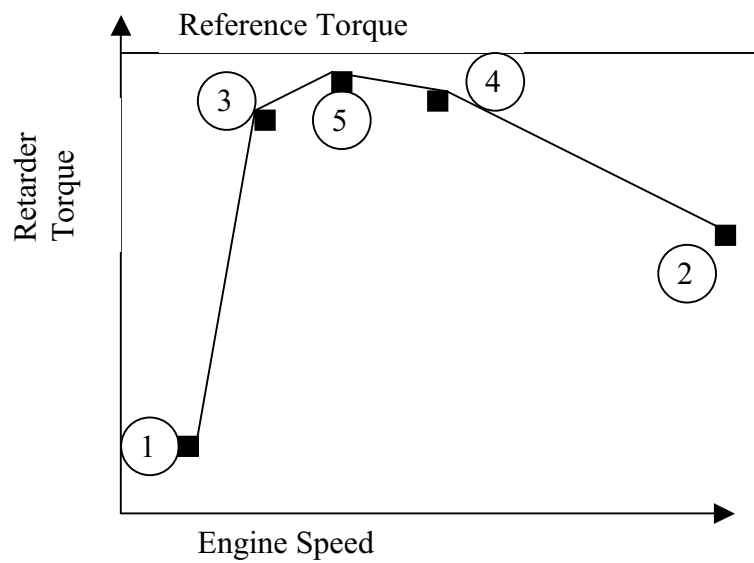


FIGURE PGN65249\_A—TYPICAL HYDRAULIC RETARDER TORQUE CURVE

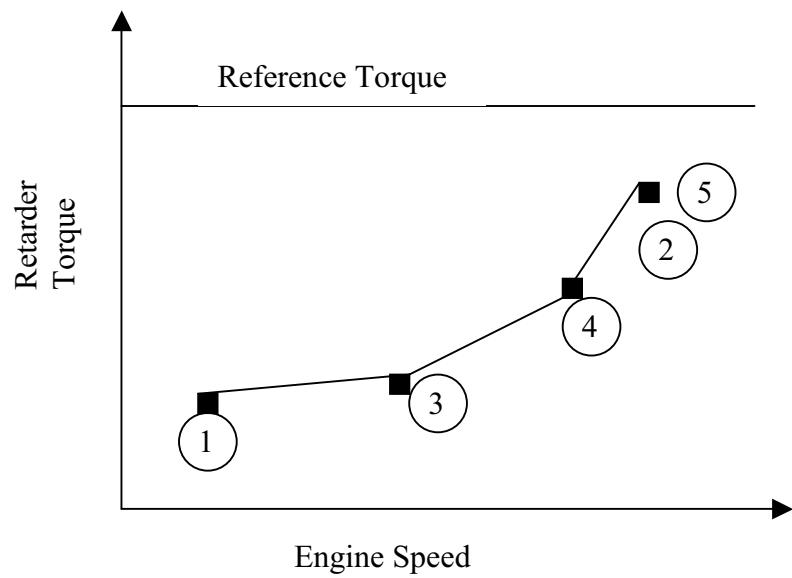


FIGURE PGN65249\_B—TYPICAL ENGINE COMPRESSION BRAKE TORQUE CURVE

**PGN 65251 – Engine Configuration 1****TABLE PGN65251\_A—ENGINE CONFIGURATION CHARACTERISTIC MODES**

| <b>Mode</b> | <b>Torque/Speed<br/>Point 2</b> | <b>Governor Gain<br/>KP</b> | <b>High Idle Speed</b> |
|-------------|---------------------------------|-----------------------------|------------------------|
| 1           | Available                       | Not available               | Available              |
| 2           | Not Available                   | Available                   | Available              |
| 3           | Available                       | Available                   | Not available          |

The following points are shown in Figures PGN65251\_A, PGN65251\_B, and PGN65251\_C.

Point 1 (required): Torque/speed point at idle

Point 2 (required): Mode 1 & 3: Torque/speed point at which the high speed governor becomes active

Mode 2: Normal torque/speed point

Point 3,4,5 (required): Torque/speed points between points 1 and 2 to permit linear interpolation over the entire torque range. It is required that one of these points indicate the peak torque point for the current engine torque map.

Point 6 (mode dependent): Mode 1 & 2: High idle speed (torque = 0)

Mode 3: Not available (point is defined by the endspeed governor where torque = 0)

Point 7 (optional): Maximum momentary engine override speed (torque = 0)

Reference engine torque: Engine torque in Nm.

This parameter is the reference value of 100% for all defined indicated engine torque parameters. It is only defined once and doesn't change if a different engine torque map becomes valid.

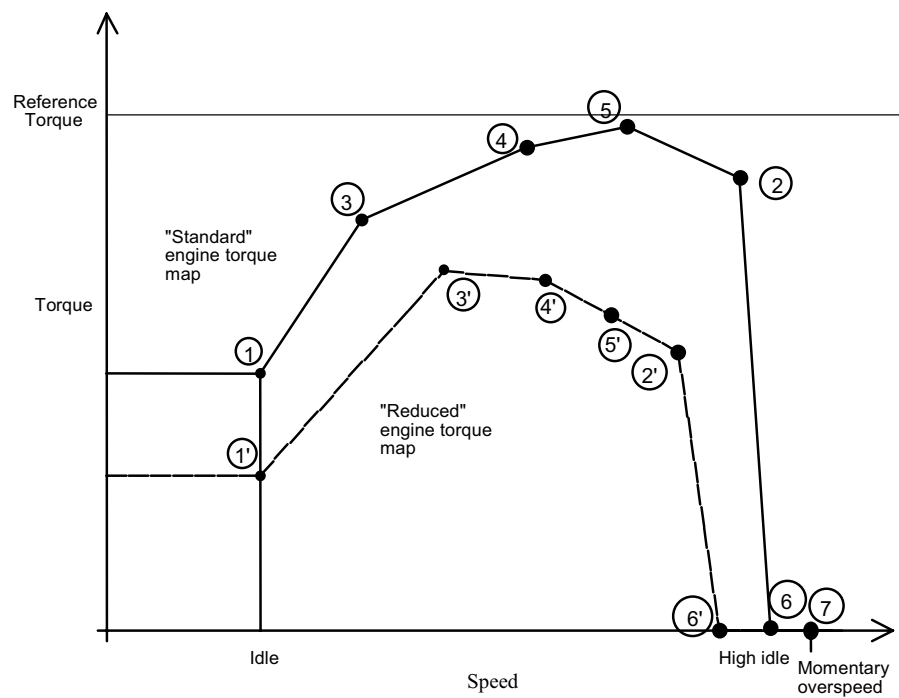


FIGURE PGN65251\_A—ENGINE CONFIGURATION MAP-MODE 1

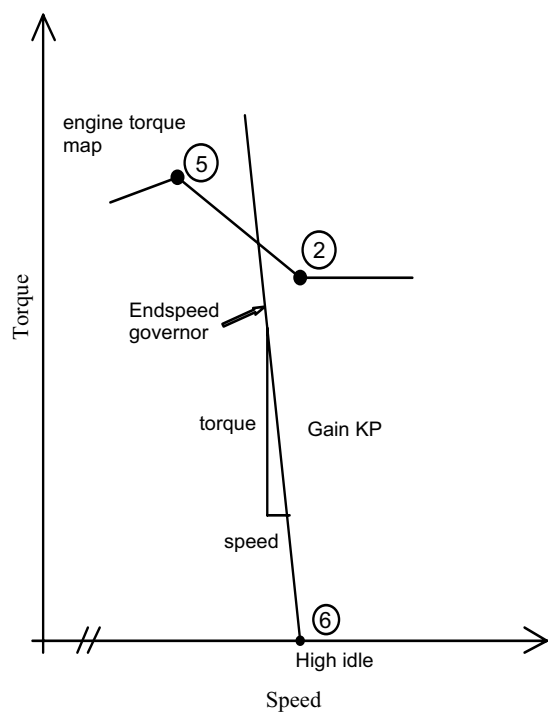


FIGURE PGN65251\_B—ENGINE CONFIGURATION MAP-MODE 2



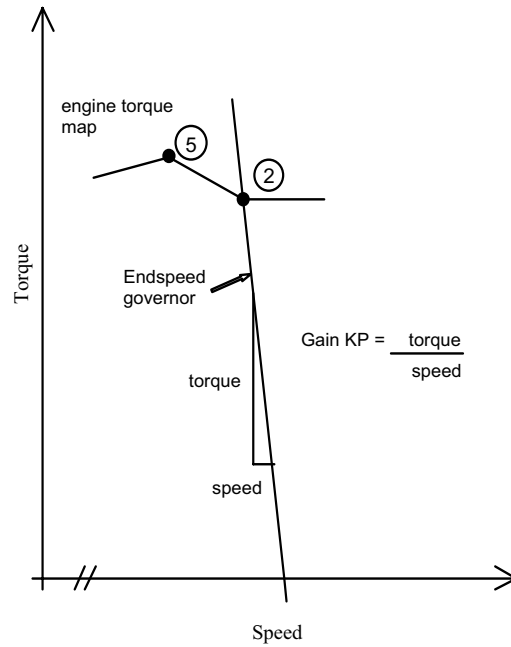
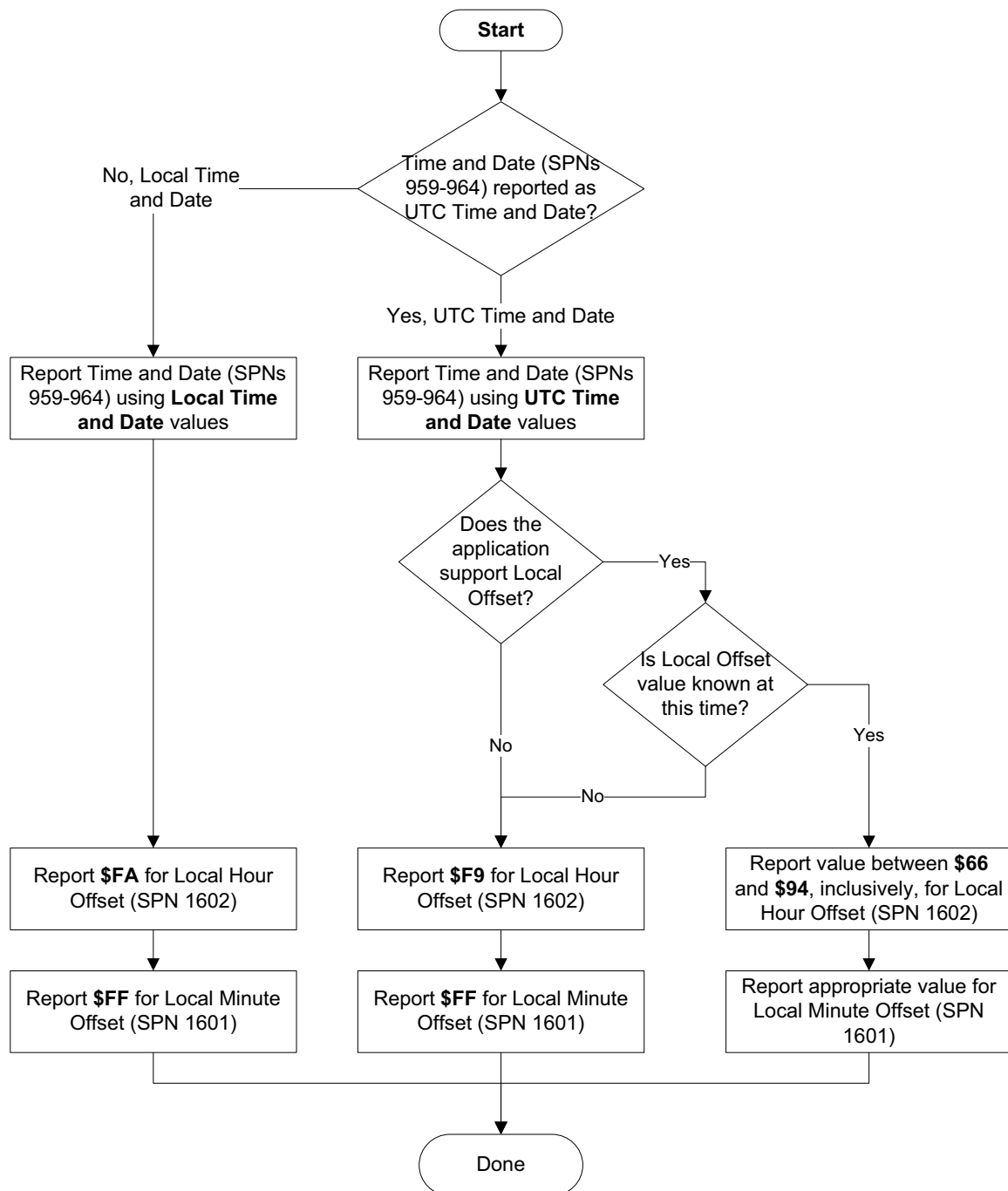


FIGURE PGN65251\_C—ENGINE CONFIGURATION MAP-MODE 3

## PGN 65254 – Time/Date Broadcast

**Decision Tree for Reporting Time and Date and Local Hour Offset**

The flow chart shows the correct values to report for the Time and Date (SPNs 959-964) and Local Hour Offset (SPN 1602), depending upon the Time Standard (UTC or Local Time) used for SPNs 959-964 data and support of Local Offset.

**FIGURE 65254\_A: FLOW CHART FOR REPORTING TIME AND DATE AND LOCAL HOUR OFFSET**

### Flow Chart for Interpreting Time and Date and Local Hour Offset

The flow chart shows how to determine the Time Standard (UTC or Local Time) used for SPNs 959-964 data and Local Offset support based upon the value reported for the Local Hour Offset (SPN 1602).

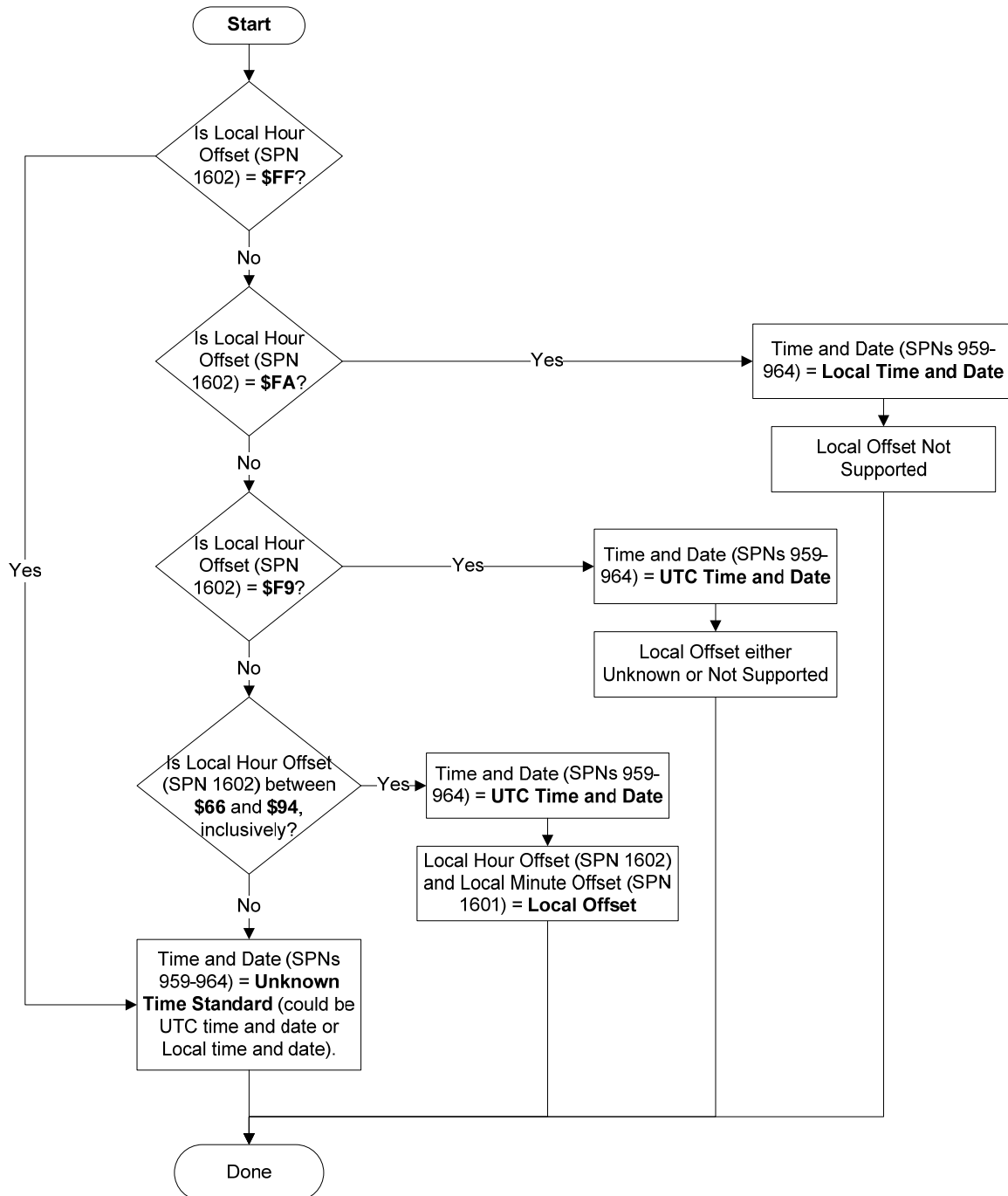


FIGURE 65254\_B: FLOW CHART FOR INTERPRETING TIME AND DATE AND LOCAL HOUR OFFSET