SAE International™

SURFACE VEHICLE RECOMMENDED PRACTICE

SAE J1587 JAN2013

Issued 1988-01
Stabilized 2013-01

Superseding J1587 JUL2008

Electronic Data Interchange Between Microcomputer Systems in Heavy-Duty Vehicle Applications

RATIONALE

Document has not been revised in 5 years and there are no current plans by any major OEMs to request modifications in the future.

STABILIZED NOTICE

This document has been declared "Stabilized" by the SAE Truck and Bus Low Speed Communication Network Committee and will no longer be subjected to periodic reviews for currency. Users are responsible for verifying references and continued suitability of technical requirements. Newer technology may exist.

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: http://www.sae.org

SAE values your input. To provide feedback on this Technical Report, please visit
http://www.sae.org/technical/standards/J1587_201301

TABLE OF CONTENTS

1. SCOPE

This SAE Recommended Practice defines a document for the format of messages and data that is of general value to modules on the data communications link. Included are field descriptions, size, scale, internal data representation, and position within a message. This document also describes guidelines for the frequency of and circumstances in which messages are transmitted.

In order to promote compatibility among all aspects of electronic data used in heavy-duty applications, it is the intention of the SAE Truck and Bus Low Speed Communications Network Subcommittee (formerly Data Format Subcommittee) (in conjunction with other industry groups) to develop recommended message formats for:

a. Vehicle and Component Information—This includes all information that pertains to the operation of the vehicle and its components (such as performance, maintenance, and diagnostic data).

b. Routing and Scheduling Information—Information related to the planned or actual route of the vehicle. It includes current vehicle location (for example, geographical coordinates) and estimated time of arrival.

c. Driver Information—Information related to driver activity. Includes driver identification, logs, (for example, DOT), driver expenses, performance, status, and payroll data.

d. Freight Information—Provides data associated with cargo being shipped, picked up, or delivered. Includes freight status, overage, shortage and damage reporting, billing and invoice information as well as customer and consignee data.

This document represents the recommended formats for basic vehicle and component identification and performance data. This document is intended as guide toward standard practice and is subject to change to keep pace with experience and technical advances.

1.1 Purpose

The purpose of this document is to define the format of the messages and data being communicated between microprocessors used in heavy-duty vehicle applications. It is meant to serve as a guide toward a standard practice to promote software compatibility among microcomputer based modules. This document is to be used with SAE J1708. SAE J1708 defines the requirements for the hardware and basic protocol that is needed to implement this document.

The primary use of the communications link and message format is expected to be the sharing of data among stand-alone modules. It is anticipated that this document (when used in conjunction with SAE J1708) will reduce the cost and complexity associated with developing and maintaining software for heavy-duty vehicle microprocessor applications.

2. REFERENCES

2.1 Applicable Publications

The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply.

2.1.1 SAE Publications

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

SAE J1455 Recommended Environmental Practices for Electrical Equipment Design in Heavy-Duty Vehicle Applications

SAE J1708 Serial Data Communications Between Microcomputer Systems in Heavy-Duty Vehicle Applications

2.1.2 ANSI/IEEE Publication

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

ANSI/IEEE Standard 754-1985 IEEE Standard for Binary Floating-Point Arithmetic
http://webstore.ansi.org/ansidocstore/product.asp?sku=754%2D1985

2.1.3 EIA Publication

Available from Electronic Industries Alliance, 2500 Wilson Blvd., Arlington, VA 22201, Tel: 703-907-7500, www.eia.org. EIA specs are available from IHS Standards Store, http://global.ihs.com/.

EIA RS-485 Standard for Electrical Characteristics of Generators and Receivers for Use in Balanced Digital Multipoint Systems, April 1983 (Superseded by TIA-485 in March 2003)

TIA-485 Electrical Characteristics of Generators and Receivers for Use in Balanced Digital Multipoint Systems, March 2003

2.1.4 RTCM Publication

Available from RTCM, 1800 N. Kent St., Suite 1060, Arlington, VA 22209, Tel: 703-527-2000, www.rtcm.org.

RTCM-104, Version 2.0 Radio Technical Commission for Maritime Services, January 1990
https://ssl29.pair.com/dmarkle/puborder.php?show=3

3. ELECTRONIC DATA INTERCHANGE

All data transmitted on the communication link, defined by SAE J1708, using message identification (MID) in the range 128 to 255, shall follow this document. Designers need to be aware that messages starting with MIDs 0 to 127 are allowed to coexist with current SAE J1587 messages. The content of the messages broadcast by MIDs 0 to 127 may or may not conform to SAE J1587 format.

3.1 Message Format

The message shall consist of the following:

Message ID
One or More Parameters
Checksum

The number of parameters in a message is limited by the total message length defined in SAE J1708. MIDs are assigned to transmitter categories as identified in Table 1.

3.2 MID Assignment List Additions

No two transmitters in the system shall have the same MID. System manufacturers may request additions be made to the MID list. The SAE Truck and Bus Low Speed Communications Network Subcommittee will review the value of any additional MIDs for general interest and/or purpose and may or may not add it to the list.

3.2.1 Available MID Space

The MID space allocated for assignment and use by SAE J1587 is almost full. In order to allow for the limited additional assignment of new MIDs, the SAE Truck and Bus Low Speed Communication Network Subcommittee has taken the following action to partition the SAE J1587 MID data space by industry segment and reclaim unused MIDs.

3.2.1.1 Transportation Industry Partitioning of MIDs (Multiple Assignment of MIDs)

Table 1 has been partitioned to identify the intended transportation segments for each MID. Although SAE J1587 is primarily utilized within Heavy-Duty vehicle applications, it has also been adopted in other transportation segments such as transit bus and marine. In some cases MIDs have been defined differently per transportation segment. Sections a and b describe how to determine the transportation segment of an ECU:

a. PID 342, Transportation Segment Identifier has been established for tools that are used in more than one transportation segment. This PID is used by diagnostic tools to determine the transportation segment of the MID of the responding ECU.

b. Legacy devices (prior to June, 2004) may not respond to this message.

3.2.1.2 Dual Naming

MIDs are sometimes assigned two names using the following rationale.

a. The need for a new MID assignment is very similar to an existing MID.

b. The two named devices could not be used simultaneously on the same vehicle network.

3.2.1.3 Reclaiming of Unused MIDs

Certain MIDs (134, 135, 148, etc...) were assigned in anticipation of their eventual use. These MIDs were never used since no method for dynamically addressing SAE J1587 MIDs on multiple trailers was specified. Reclaimed MIDs are marked in table 1 as "Reclaimed". In the next publication of this document, these MIDs will be shown as "Reserved for future assignment by SAE," if they have not been assigned new names or the reclaiming has been negated by use in the field of these MIDs. Any concerns of the reclaiming of MID assignments should be brought to the attention of SAE Truck and Bus Low Speed Communication Network Subcommittee.

3.2.1.4 The Feb2002 version of Table 1 has been preserved for reference in Appendix G.

TABLE 1 - MESSAGE ID ASSIGNMENT LIST

MID #	Basic Heavy Duty	Mass Transit Specific	Marine Specific
0-127	Defined by SAE J1708	Defined by SAE J1708	Defined by SAE J1708
128	Engine #1	Engine #1	Engine #1
129	Turbocharger	Turbocharger	Turbocharger
130	Transmission	Transmission	Transmission
131	Power Takeoff	-	-
132	Axle, Power Unit	Axle, Power Unit	-
133	Axle, Trailer	Axle, Trailer	-
134	(Reclaimed)	-	-
135	(Reclaimed)	-	-
136	Brakes, Power Unit	Brakes, Power Unit	-
137	Brakes, Trailer #1	Brakes, Trailer #1	-
138	Brakes, Trailer #2	-	-
139	Brakes, Trailer #3	-	-
140	Instrument Cluster	Instrument Cluster	Instrument Cluster
141	Trip Recorder	Trip Recorder	Trip Recorder
142	Vehicle Management System	Vehicle Management System	Vehicle Management System
143	Fuel System	Fuel System	Fuel System
144	Cruise Control	Cruise Control	-
145	Road Speed Indicator	Road Speed Indicator	-
146	Cab Climate Control	Cab Climate Control	Cab Climate Control
147	Cargo Refrigeration / Heating, Trailer		-
148	(Reclaimed)	-	-
149	(Reclaimed)	-	-
150	Suspension, Power Unit	Suspension, Power Unit	-
151	Suspension, Trailer	Suspension, Trailer #1	-
152	(Reclaimed)	-	-
153	(Reclaimed)	-	-
154	Diagnostic Systems, Power Unit	Diagnostic Systems, Power Unit	-
155	Diagnostic Systems, Trailer	Diagnostic Systems, Trailer #1	-
156	(Reclaimed)	-	-
157	(Reclaimed) Park Brake Controller	Park Brake Controller	-
158	Electrical Charging System	Electrical Charging System	Electrical Charging System
159	Proximity Detector, Front	Proximity Detector, Front	Proximity Detector, Front
160	Proximity Detector, Rear	Proximity Detector, Rear	Proximity Detector, Rear
161	Aerodynamic Control Unit	Aerodynamic Control Unit	Aerodynamic Control Unit
162	Vehicle Navigation Unit	Vehicle Navigation Unit	Vehicle Navigation Unit
163	Vehicle Security	Vehicle Security	Vehicle Security
164	Multiplex	Multiplex	Multiplex
165	Communication Unit-Ground	Communication Unit-Ground	Communication Unit-Ground
166	Tires, Power Unit	Tires, Power Unit	-
167	Tires, Trailer	Tires, Trailer	-
168	Tires, Trailer #2	-	-
169	Tires, Trailer #3	-	-
170	Electrical	Electrical	Electrical
171	Driver Information Center #1	Driver Information Center #1	Driver Information Center #1
172	Off-board Diagnostics #1	Off-board Diagnostics #1	Off-board Diagnostics #1
173	Engine Retarder	Engine Retarder	-

TABLE 1 - MESSAGE ID ASSIGNMENT LIST (CONTINUED)

MID #	Basic Heavy Duty	Mass Transit Specific	Marine Specific
174	Cranking/Starting System	Cranking/Starting System	-
175	Engine #2	Engine #2	Engine #2
176	Transmission, Additional / Hybrid Control Module	Transmission, Additional / Hybrid Control Module	-
177	Particulate Trap System	Particulate Trap System	-
178	Vehicle Sensors to Data Converter	Vehicle Sensors to Data Converter	-
179	Data Logging Computer	Data Logging Computer	-
180	Off-board Diagnostics #2	Off-board Diagnostics #2	-
181	Communication Unit-Satellite	Communication Unit-Satellite	-
182	Off-board Programming Station	Off-board Programming Station	-
183	Engine #3	Engine #3	Engine #3
184	Rear Axle Steering Controller	Rear Axle Steering Controller	Engine #4
185	Pneumatic System Controller	Pneumatic System Controller	Engine #5
186	Tires Control Unit	Tires Control Unit	Engine #6
187	Vehicle Management System #2	Vehicle Control Head Unit	-
188	Vehicle Management System #3	Vehicle Logic Control Unit	-
189	-	Vehicle Head Signs	-
190	Refrigerant Management Protection and Diagnostics	Refrigerant Management Protection and Diagnostics	Refrigerant Management Protection and Diagnostics
191	Vehicle Location Unit-Differential Correction	Vehicle Location Unit-Differential Correction	Vehicle Location Unit-Differential Correction
192	-	Front Door (Door #1) Status Unit	-
193	-	Middle Door (Door #2) Status Unit	-
194	-	Rear Door (Door #3) Status Unit	-
195	Annunciator Unit	Annunciator Unit	Annunciator Unit
196	-	Fare Collection Unit	-
197	-	Passenger Counter Unit #1	-
198	-	Schedule Adherence Unit	-
199	-	Route Adherence Unit	-
200	Environment Monitor Unit / Auxiliary Cab Climate Control	Environment Monitor Unit / Auxiliary Cab Climate Control	Environment Monitor Unit / Auxiliary Cab Climate Control
201	Vehicle Status Points Monitor Unit	Vehicle Status Points Monitor Unit	Vehicle Status Points Monitor Unit
202	High Speed Communications Unit	High Speed Communications Unit	High Speed Communications Unit
203	Mobile Data Terminal Unit	Mobile Data Terminal Unit	Mobile Data Terminal Unit
204	Vehicle Proximity, Right Side	Vehicle Proximity, Right Side	Vehicle Proximity, Right Side
205	Vehicle Proximity, Left Side	Vehicle Proximity, Left Side	Vehicle Proximity, Left Side
206	Base Unit (Radio Gateway to Fixed End)	Base Unit (Radio Gateway to Fixed End)	Base Unit (Radio Gateway to Fixed End)
207	Bridge from SAE J1708 Drivetrain Link	Bridge from SAE J1708 Drivetrain Link	Bridge from SAE J1708 Drivetrain Link
208	Maintenance Printer	Maintenance Printer	Maintenance Printer
209	Fifth Wheel Hitch Monitoring Device	Vehicle Turntable	-
210	-	Bus Chassis Identification Unit	-
211	Smart Card Terminal	Smart Card Terminal	Smart Card Terminal
212	Mobile Data Terminal	Mobile Data Terminal	Mobile Data Terminal
213	Vehicle Control Head Touch Screen	Vehicle Control Head Touch Screen	Vehicle Control Head Touch Screen
214	Silent Alarm Unit	Silent Alarm Unit	Silent Alarm Unit
215	-	Surveillance Microphone	-
216	Lighting Control Administrator Unit	Lighting Control Administrator Unit	Lighting Control Administrator Unit
217	Tractor/Trailer Gateway, Tractor Mounted	-	-
218	Tractor/Trailer Gateway, Trailer Mounted	-	-

TABLE 1 - MESSAGE ID ASSIGNMENT LIST (CONTINUED)

MID #	Basic Heavy Duty	Mass Transit Specific	Marine Specific
219	Collision Avoidance Systems	Collision Avoidance Systems	Collision Avoidance Systems
220	Tachograph	Tachograph	Tachograph
221	Driver Information Center #2	Driver Information Center #2	Driver Information Center #2
222	Driveline Retarder	Driveline Retarder	-
223	Transmission Shift Console-Primary	Transmission Shift Console-Primary	Transmission Shift Console-Primary
224	Parking Heater	Parking Heater	-
225	Weighing System, Axle Group #1 / Vehicle	Weighing System, Axle Group #1 / Vehicle	-
226	Weighing System, Axle Group #2	Weighing System, Axle Group #2	-
227	Weighing System, Axle Group #3	Weighing System, Axle Group #3	-
228	Weighing System, Axle Group #4	Weighing System, Axle Group #4	-
229	Weighing System, Axle Group #5	Weighing System, Axle Group #5	-
230	Weighing System, Axle Group #6	Weighing System, Axle Group #6	-
231	Communication Unit-Cellular	Communication Unit-Cellular	Communication Unit-Cellular
232	Safety Restraint System #1	Safety Restraint System #1	Safety Restraint System #1
233	Intersection Preemption Emitter	Intersection Preemption Emitter	-
234	Instrument Cluster #2	Instrument Cluster #2	Instrument Cluster #2
235	Engine Oil Control System	Engine Oil Control System	Engine Oil Control System
236	-	Entry Assist Control #1	-
237	-	Entry Assist Control #2	-
238	Idle Adjust System	Idle Adjust System	Idle Adjust System
239	-	Passenger Counter Unit #2	-
240	-	Passenger Counter Unit #3	-
241	Fuel Tank Monitor	Fuel Tank Monitor	Fuel Tank Monitor
242	(Reclaimed)	Door # 4 Status Unit	-
243	(Reclaimed)	Door # 5 Status Unit	-
244	(Reclaimed)	Door # 6 Status Unit	-
245	Weighing System Display	Door # 7 Status Unit	-
246	Brakes, Trailer #4	Door # 8 Status Unit	-
247	Brakes, Trailer #5	-	-
248	Forward Road Image Processor	Forward Road Image Processor	-
249	Body Controller	Body Controller	Body Controller
250	Steering Column Unit	Steering Column Unit	Steering Column Unit
251	(Reclaimed)	-	-
252	(Reclaimed)	-	-
253	Brake Stroke Alert Monitor, Tractor	Brake Stroke Alert Monitor, Tractor	-
254	Safety Restraint System #2	Safety Restraint System #2	Safety Restraint System #2
255	Reserved-to be assigned	Reserved-to be assigned	Reserved-to be assigned

NOTE: Designers need to be aware that messages starting with MIDs 0 to 127 are allowed to coexist with current SAE J1587 messages. The content of the messages broadcast by MIDs 0 to 127 may or may not conform to SAE J1587 format.

3.3 Parameter Identification Assignments

The first character of every parameter shall be the parameter identification character (PID). The permitted range of PIDs shall include numbers 0 to 255. Assignment of a PID to a parameter shall be done according to the number of data characters required by the parameter.

PIDs 256 to 511 represent a second page of PIDs (page 2) for use with the extension PID 255. These PIDs are transmitted modulo 256, such that PID 256 is transmitted as 0, PID 257 is transmitted as 1, etc.

PIDs 512 to 767 represent a third page of PIDs (page 3) for use with the extension PID 511. These PIDs are transmitted modulo 512, such that PID 512 is transmitted as 0, PID 513 is transmitted as 1, etc.

PIDs 768 to 1023 represent a fourth page of PIDs (page 4) for use with the extension PID 767. These PIDs are transmitted modulo 768, such that PID 768 is transmitted as 0, PID 769 is transmitted as 1, etc.

PIDs (0 to 127), (256 to 383), (512 to 639) and (768 to 895) shall be allocated to parameters using a single data character to represent its value. The single data character follows the PID.

PIDs (128 to 191), (384 to 447), (640 to 703) and (896 to 959) shall be allocated to double data character parameters. The two data characters follow the PID.

Parameters requiring more than two data characters and parameters requiring varying numbers of data characters shall be allocated PIDs (192 to 253), (448 to 509), (704 to 765), (960 to 1021). The number of data characters used is contained in the first character after the PID. This character count is followed by the specified number of data characters. The minimum character count value is 0. The maximum character count is limited by the total message character count permitted by SAE J1708.

PID 254 and 510 are data link escape PIDs. All characters excluding the message checksum following an escape PID are defined as escape data. The first data byte contains the Message ID of the desired receiving device. The remaining escape data is to be defined by the manufacturer of the transmitting device and may be disclosed in an applications document (reference SAE J1708). These are used to transmit special commands, data, and other proprietary information to a specified component.

PIDs 255, 511, and 767 are extension PIDs. All characters in this message following an extension PID (excluding the message checksum) are to be interpreted using their applicable extended definitions. When receiving data following PID 255, 511 or 767, a value of 256, 512 or 768 should be added accordingly, to each PID received to determine the correct page PID identification.

The format of a message incorporating PID 255 is as follows:

MID, PID=255, PID/Data, [PID/Data, PID/Data, ...], Checksum

where the PIDs in this message are interpreted as PID 256 to 511.

Similarly, the format of a message incorporating PID 767 is as follows:

MID, PID=255, PID=255, PID=255, PID/Data, [PID/Data, PID/Data, ...], Checksum

where the PIDs in this message are interpreted as PID 768 to 1023.

Page extension indicators are only valid immediately following the MID.

The PID assignment list is shown in Table 2.

The procedure for assigning new PIDs is contained in section 3.10.

TABLE 2 - PARAMETER IDENTIFICATION ASSIGNMENT LIST

PID	Parameter
	Single Data Character Length Parameters
0	Request Parameter
1[(1)(2)]	Reserved – To be assigned
2[(1)(2)]	Reserved – To be assigned
3[(1)(2)]	Reserved – To be assigned
4	Dynamic MID Claim for SAE J2497 Gateway Devices
5[(1)(2)]	Reserved – To be assigned
6[(1)(2)]	Reserved – To be assigned
7	Axle #2 Lift Air Pressure
8	Brake System Air Pressure Low Warning Switch Status
9	Axle Lift Status
10	Axle Slider Status
11	Cargo Securement
12	Brake Stroke Status
13	Entry Assist Position/Deployment
14	Entry Assist Motor Current
15	Fuel Supply Pump Inlet Pressure
16	Suction Side Fuel Filter Differential Pressure
17	Engine Oil Level Remote Reservoir
18	Extended Range Fuel Pressure
19	Extended Range Engine Oil Pressure
20	Extended Range Engine Coolant Pressure
21	Engine ECU Temperature
22	Extended Engine Crankcase Blow-by Pressure
23	Generator Oil Pressure
24	Generator Coolant Temperature
25	Air Conditioner System Status #2
26	Estimated Percent Fan Speed
27	Percent Exhaust Gas Recirculation Valve #1 Position
28	Percent Accelerator Position #3
29	Percent Accelerator Position #2
30	Crankcase Blow-by Pressure
31	Transmission Range Position
32	Transmission Splitter Position
33	Clutch Cylinder Position
34	Clutch Cylinder Actuator Status
35	Shift Finger Actuator Status #2
36	Clutch Plates Wear Condition
37	Transmission Tank Air Pressure
38	Second Fuel Level (Right Side)
39	Tire Pressure Check Interval
40	Engine Retarder Switches Status
41	Cruise Control Switches Status
42	Pressure Switch Status
43	Ignition Switch Status

TABLE 2 - PARAMETER IDENTIFICATION ASSIGNMENT LIST (CONTINUED)

PID	Parameter
44	Attention/Warning Indicator Lamps Status
45	Inlet Air Heater Status
46	Vehicle Wet Tank Pressure
47	Retarder Status
48	Extended Range Barometric Pressure
49	ABS Control Status
50	Air Conditioner System Clutch Status/Command #1
51	Throttle Position
52	Engine Intercooler Temperature
53	Transmission Synchronizer Clutch Value
54	Transmission Synchronizer Brake Value
55	Shift Finger Positional Status
56	Transmission Range Switch Status
57	Transmission Actuator Status #2
58	Shift Finger Actuator Status
59	Shift Finger Gear Position
60	Shift Finger Rail Position
61	Parking Brake Actuator Status
62	Retarder Inhibit Status
63	Transmission Actuator Status #1
64	Direction Switch Status
65	Service Brake Switch Status
66	Vehicle Enabling Component Status
67	Shift Request Switch Status
68	Torque Limiting Factor
69	Two Speed Axle Switch Status
70	Parking Brake Switch Status
71	Idle Shutdown Timer Status
72	Blower Bypass Value Position
73	Auxiliary Water Pump Pressure
74	Maximum Road Speed Limit
75	Steering Axle Temperature
76	Axle #1 Lift Air Pressure
77	Forward Rear Drive Axle Temperature
78	Rear Rear-Drive Axle Temperature
79	Road Surface Temperature
80	Washer Fluid Level
81	Particulate Trap Inlet Pressure
82	Air Start Pressure
83	Road Speed Limit Status
84	Road Speed
85	Cruise Control Status
86	Cruise Control Set Speed
87	Cruise Control High-Set Limit Speed
88	Cruise Control Low-Set Limit Speed
89	Power Takeoff Status
90	PTO Oil Temperature
91	Percent Accelerator Pedal Position

TABLE 2 - PARAMETER IDENTIFICATION ASSIGNMENT LIST (CONTINUED)

PID	Parameter
92	Percent Engine Load
93	Output Torque
94	Fuel Delivery Pressure
95	Fuel Filter Differential Pressure
96	Fuel Level
97	Water in Fuel Indicator
98	Engine Oil Level
99	Engine Oil Filter Differential Pressure
100	Engine Oil Pressure
101	Crankcase Pressure
102	Boost Pressure
103	Turbocharger #1 Speed
104	Turbo Oil Pressure
105	Intake Manifold Temperature
106	Air Inlet Pressure
107	Air Filter Differential Pressure
108	Barometric Pressure
109	Coolant Pressure
110	Engine Coolant Temperature
111	Coolant Level
112	Coolant Filter Differential Pressure
113	Governor Droop
114	Net Battery Current
115	Alternator Current
116	Brake Application Pressure
117	Brake Primary Pressure
118	Brake Secondary Pressure
119	Hydraulic Retarder Pressure
120	Hydraulic Retarder Oil Temperature
121	Engine Retarder Status
122	Engine Retarder Percent
123	Clutch Pressure
124	Transmission Oil Level
125	Transmission Oil Level High/Low
126	Transmission Filter Differential Pressure
127	Transmission Oil Pressure
	Double Data Character Length Parameters
128	Component-specific request
129	Injector Metering Rail #2 Pressure
130	Power Specific Fuel Economy
131	Exhaust Back Pressure
132	Mass Air Flow
133	Average Fuel Rate
134	Wheel Speed Sensor Status

TABLE 2 - PARAMETER IDENTIFICATION ASSIGNMENT LIST (CONTINUED)

PID	Parameter
135	Extended Range Fuel Delivery Pressure (Absolute)
136	Auxiliary Vacuum Pressure Reading
137	Auxiliary Gage Pressure Reading #1
138	Auxiliary Absolute Pressure Reading
139	Tire Pressure Control System Channel Functional Mode
140	Tire Pressure Control System Solenoid Status
141	Trailer #1, Tag #1, or Push Channel #1 Tire Pressure Target
142	Drive Channel Tire Pressure Target
143	Steer Channel Tire Pressure Target
144	Trailer #1, Tag #1, or Push Channel #1 Tire Pressure
145	Drive Channel Tire Pressure
146	Steer Channel Tire Pressure
147	Average Fuel Economy (Natural Gas)
148	Instantaneous Fuel Economy (Natural Gas)
149	Fuel Mass Flow Rate (Natural Gas)
150	PTO Engagement Control Status
151	ATC Control Status
152	Number of ECU Resets
153	Crankcase Pressure
154	Auxiliary Input and Output Status #2
155	Auxiliary Input and Output Status #1
156	Injector Timing Rail Pressure
157	Injector Metering Rail Pressure
158	Battery Potential (Voltage)—Switched
159	Gas Supply Pressure
160	Main Shaft Speed
161	Input Shaft Speed
162	Transmission Range Selected
163	Transmission Range Attained
164	Injection Control Pressure
165	Compass Bearing
166	Rated Engine Power
167	Alternator Potential (Voltage)
168	Battery Potential (Voltage)
169	Cargo Ambient Temperature
170	Cab Interior Temperature
171	Ambient Air Temperature
172	Air Inlet Temperature
173	Exhaust Gas Temperature
174	Fuel Temperature
175	Engine Oil Temperature
176	Turbo Oil Temperature
177	Transmission #1 Oil Temperature
178	Front Axle Weight
179	Rear Axle Weight
180	Trailer Weight
181	Cargo Weight

TABLE 2 - PARAMETER IDENTIFICATION ASSIGNMENT LIST (CONTINUED)

PID	Parameter
182	Trip Fuel
183	Fuel Rate (Instantaneous)
184	Instantaneous Fuel Economy
185	Average Fuel Economy
186	Power Takeoff Speed
187	Power Takeoff Set Speed
188	Idle Engine Speed
189	Rated Engine Speed
190	Engine Speed
191	Transmission Output Shaft Speed
	Variable and Long Data Character Length Parameters
192	Multisection Parameter
193(1)	Transmitter System Diagnostic Table
194	Transmitter System Diagnostic Code and Occurrence Count Table
195	Diagnostic Data Request/Clear Count
196	Diagnostic Data/Count Clear Response
197	Connection Management
198	Connection Mode Data Transfer
199	Traction Control Disable State
200-202	Reserved – to be assigned
203	Particulate Trap Gas Outlet Temperature
204	Data Transfer Marker, SAE J1587 / SAE J2497 (page 1)
205	Time Point Encounter
206	Agency Identification
207	Cashbox Information
208	Total Refrigerant Compressor Hours
209	ABS Control Status, Trailer
210	Tire Temperature (By Sequence Number)
211	Tire Pressure (By Sequence Number)
212	Tire Pressure Target (By Sequence Number)
213	Wheel End Assembly Vibration Level
214	Vehicle Wheel Speeds
215	Brake Temperature
216	Wheel Bearing Temperature
217	Fuel Tank/Nozzle Identification
218	State Line Crossing
219	Current State and Country
220	Engine Torque History
221	Anti-theft Request
222	Anti-theft Status
223	Auxiliary A/D Counts
224	Immobilizer Security Code
225	Text Message Acknowledged

TABLE 2 - PARAMETER IDENTIFICATION ASSIGNMENT LIST (CONTINUED)

PID	Parameter
226	Text Message to Display
227	Text Message Display Type
228	Speed Sensor Calibration
229	Total Fuel Used (Natural Gas)
230	Total Idle Fuel Used (Natural Gas)
231	Trip Fuel (Natural Gas)
232	DGPS Differential Correction
233	Unit Number (Power Unit)
234	Software Identification
235	Total Idle Hours
236	Total Idle Fuel Used
237	Vehicle Identification Number
238	Velocity Vector
239	Vehicle Position
240	Change Reference Number
241	Tire Pressure by Position
242	Tire Temperature by Position
243	Component Identification
244	Trip Distance
245	Total Vehicle Distance
246	Total Vehicle Hours
247	Total Engine Hours
248	Total PTO Hours
249	Total Engine Revolutions
250	Total Fuel Used
251	Clock
252	Date
253	Elapsed Time
	Special Parameters
254	Data Link Escape
255	Extension
	Single Data Character Length Parameters (modulo 256 value identified in parentheses)
256 (0)	Request Parameter
257 (1)	Cold Restart of Specific Component
258 (2)	Warm Restart of Specific Component
259 (3)	Component Restart Response
260-340	Reserved (page 2) to be assigned
341	Engine Shutdown Override Switch
342 (86)	Transportation Segment Identifier
343 (87)	Engine Coolant Pump Differential Pressure
344 (88)	Driver Logon Status
345 (89)	Suspension Control Status #1
346 (90)	Suspension Control Status #2

TABLE 2 - PARAMETER IDENTIFICATION ASSIGNMENT LIST (CONTINUED)

PID	Parameter
347 (91)	Farebox Probe Type
348 (92)	Cargo Refrigeration System Operating Mode, Zone #1
349 (93)	Cargo Refrigeration System Operating Mode, Zone #2
350 (94)	Cargo Refrigeration System Operating Mode, Zone #3
351 (95)	Turbocharger Compressor Inlet Temperature
352 (96)	Turbocharger #2 Speed
353 (97)	Fuel Leakage Status
354 (98)	Relative Humidity
355 (99)	Engine Oil Life
356 (100)	Fifth Wheel Coupling Status
357 (101)	Ride Adjustment Pressure
358 (102)	Air Suspension #2 Pressure
359 (103)	Air Suspension #1 Pressure
360 (104)	Axle #4 Lift Air Pressure
361 (105)	Axle #3 Lift Air Pressure
362 (106)	Percent Exhaust Gas Recirculation Valve #2 Position
363 (107)	Hydraulic Retarder Control Air Pressure
364 (108)	HVAC Unit Discharge Temperature
365 (109)	Weighing System Status Command
366 (110)	Engine Oil Level High/Low
367 (111)	Lane Tracking System Status
368 (112)	Lane Departure Indication
369 (113)	Distance to Rear Object (Reverse)
370 (114)	Trailer Pneumatic Brake Control Line Pressure
371 (115)	Trailer Pneumatic Supply Line Pressure
372 (116)	Remote Accelerator
373 (117)	Center Rear Drive Axle Temperature
374 (118)	Alternator AC Voltage
375 (119)	Fuel Return Pressure
376 (120)	Fuel Pump Inlet Vacuum
377 (121)	Compression Unbalance
378 (122)	Fare Collection Unit Status
379 (123)	Door Status
380 (124)	Articulation Angle
381 (125)	Vehicle Use Status
382 (126)	Transit Silent Alarm Status
383 (127)	Vehicle Acceleration
	Double Data Character Length Parameters
384 (128)	Component-specific request
385 (129)	Intake Valve Actuation System Oil Pressure
386 (130)	Evaporator Coil Temperature, Zone #1
387 (131)	Evaporator Coil Temperature, Zone #2
388 (132)	Evaporator Coil Temperature, Zone #3
389 (133)	Cargo Temperature Setpoint, Zone #1
390 (134)	Cargo Temperature Setpoint, Zone #2

TABLE 2 - PARAMETER IDENTIFICATION ASSIGNMENT LIST (CONTINUED)

PID	Parameter
391 (135)	Cargo Temperature Setpoint, Zone #3
392 (136)	Evaporator Supply (Discharge) Air Temperature #2, Zone #1
393 (137)	Evaporator Supply (Discharge) Air Temperature #2, Zone #2
394 (138)	Evaporator Supply (Discharge) Air Temperature #2, Zone #3
395 (139)	Evaporator Supply (Discharge) Air Temperature #1, Zone #1
396 (140)	Evaporator Supply (Discharge) Air Temperature #1, Zone #2
397 (141)	Evaporator Supply (Discharge) Air Temperature #1, Zone #3
398 (142)	Evaporator Return Air Temperature #2, Zone #1
399 (143)	Evaporator Return Air Temperature #2, Zone #2
400 (144)	Evaporator Return Air Temperature #2, Zone #3
401 (145)	Evaporator Return Air Temperature #1, Zone #1
402 (146)	Evaporator Return Air Temperature #1, Zone #2
403 (147)	Evaporator Return Air Temperature #1, Zone #3
404 (148)	Turbocharger Compressor Outlet Temperature
405 (149)	Safety Restraint System Trigger Status
406 (150)	HVAC Blower Motor Speed
407 (151)	Axle Group Full Weight Calibration
408 (152)	Axle Group Empty Weight Calibration
409 (153)	Axle Group Weight
410 (154)	Extended Range Road Surface Temperature
411 (155)	Recirculated Engine Exhaust Gas Differential Pressure
412 (156)	Recirculated Engine Exhaust Gas Temperature
413 (157)	Net Vehicle Weight Change
414 (158)	Air Conditioner Refrigerant Low Side Pressure
415 (159)	Air Conditioner Refrigerant High Side Pressure
416 (160)	Evaporator Temperature
417 (161)	Gross Vehicle Weight
418 (162)	Transmission # 2 Oil Temperature
419 (163)	Starter Circuit Resistance
420 (164)	Starter Current (Average)
421 (165)	Alternator/Generator Negative Cable Voltage
422 (166)	Auxiliary Current
423 (167)	Extended Range Net Battery Current
424 (168)	DC Voltage
425 (169)	Auxiliary Frequency
426 (170)	Alternator/Generator Field Voltage
427 (171)	Battery Resistance Change
428 (172)	Battery Internal Resistance
429 (173)	Starter Current Peak
430 (174)	Starter Solenoid Voltage
431 (175)	Starter Negative Cable Voltage
432 (176)	Starter Motor Voltage
433 (177)	Fuel Shutoff Solenoid Voltage
434 (178)	AC Voltage
435 (179)	Cargo Ambient Temperature (By location)
436 (180)	Trip Sudden Decelerations
437 (181)	Trailer #2, Tag #2, or Push Channel #2 Tire Pressure Target

TABLE 2 - PARAMETER IDENTIFICATION ASSIGNMENT LIST (CONTINUED)

PID	Parameter
438 (182)	Trailer #2, Tag #2, or Push Channel #2 Tire Pressure
439 (183)	Extended Range Boost Pressure #1
440 (184)	Extended Range Boost Pressure #2
441 (185)	Auxiliary Temperature #1
442 (186)	Auxiliary Temperature #2
443 (187)	Auxiliary Gage Pressure Reading #2
444 (188)	Battery #2 Potential (Voltage)
445 (189)	Cylinder Head Temperature Bank B (right bank)
446 (190)	Cylinder Head Temperature Bank A (left bank)
447 (191)	Passenger Counter
	Variable and Long Data Character Length Parameters
448 (192)	Page 2 Multisection Parameter
449 (193)	Reporting Interval Request
450 (194)	Bridge Filter Control
451–497	Reserved (page 2)—to be assigned
498 (242)	Send Keypress Command
499 (243)	Driver Interface Unit (DIU) Object/Form Command
500 (244)	Intersection Preemption Status and Configuration
501 (245)	Signage Message
502 (246)	Fare Collection Unit—Point of Sale
503 (247)	Fare Collection Unit—Service Detail
504 (248)	Annunciator Voice Message
505 (249)	Vehicle Control Head Keyboard Message
506 (250)	Vehicle Control Head Display Message
507 (251)	Driver Identification
508 (252)	Transit Route Identification
509 (253)	Mile Post Identification
	Special Parameters
510 (254)	Page 2 Data Link Escape
511 (255)	Page 2 Extension
	Single Data Character Length Parameters (modulo 512 value identified in parentheses)
512-639	Reserved (page 3) to be assigned
	Double Data Character Length Parameters
640-703	Reserved (page 3) to be assigned
	Variable and Long Data Character Length Parameters
704-765	Reserved (page 3) to be assigned

TABLE 2 - PARAMETER IDENTIFICATION ASSIGNMENT LIST (CONTINUED)

PID	Parameter
	Special Parameters
767	Page 3 Extension
	Single Data Character Length Parameters
	(modulo 768 value identified in parentheses)
768-895	Reserved (page 4) to be assigned
	Double Data Character Length Parameters
896-959	Reserved (page 4) to be assigned
	Variable and Long Data Character Length Parameters
960-1021	Reserved (page 4) to be assigned

1. These PIDs are superseded by PIDs 194, 195, and 196.
2. PIDs 1-3 and 5-6 were reclaimed as of the 2007 standard.

3.4 Parameter Data Types

Parameter data shall use one or more of the following data types as in Table 3:

TABLE 3 - PARAMETER DATA TYPES

Data-Type	Characters
Binary Bit-Mapped (B/BM)	1
Unsigned Short Integer (Uns/SI)	1
Signed Short Integer (S/SI)	1
Unsigned Integer (Uns/I)	2
Signed Integer (S/I)	2
Unsigned Long Integer (Uns/LI)	4
Signed Long Integer (S/LI)	4
Alphanumeric (ALPHA)	1
Single-Precision Floating-Point (SP/FP)	4
Double-Precision Floating-Point (DP/FP)	8

Alphanumeric data will be transmitted with the most significant character first. All other data will be transmitted least significant character first.

Signed integer values will use two's complement notation.

Unless otherwise specified, alphanumeric characters will conform to the ISO Latin 1 ASCII character set as shown in 3.4.2.

Floating-Point values will conform to the IEEE Floating-Point Standard.

3.4.1 Temperature Scaling

All parameters which identify temperatures are transmitted in degree Fahrenheit. Conversion to degree Celsius is the responsibility of the receiver of the data.

3.4.2 ISO Latin 1 Character Set

Horizontal boldface characters are the single hexidecimal digit representing the lower nibble of the single byte code for the character. Vertical boldface characters are the single hexidecimal digit representing the upper nibble of the single byte code for the character. See Figure 1.

	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	¡	¢	£	¤	¥	|	§	¨	©	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

FIGURE 1 - ISO LATIN 1 CHARACTER SET

3.5 Parameter Transmission Update Period and Message Priority

The update period and message priority at which a parameter is transmitted on the data link is primarily the responsibility of the transmitting electronic device. Because overloading the data link and providing compatible update rates are major concerns, a recommended transmission update period and message priority for each parameter is included in Appendix A. Variations from the listed update periods shall be included in the application document (reference SAE J1708).

If multiple parameters are grouped into one message, the message assignment would be based on the highest message priority associated with the group parameters. All requested parameters were assigned the lowest message priority, priority 8, so that the messages would not disrupt the regularly broadcast data.

3.6 Parameter Definitions

See Appendix A for parameter definitions.

3.7 Transport Protocol Definitions

The SAE J1587 transport protocol provides a mechanism for transmitting free-form data that extends beyond 21 bytes. The protocol consists of PID 197, Connection Management and PID 198, Connection Mode Data Transfer. The Connection Management Control Command list is shown in Table 4 and the Standardized Free-format Data Assignments list is shown in Table 5. See Appendix B for a discussion on the use of these PIDs and their related tables.

TABLE 4 - CONNECTION MANAGEMENT CONTROL COMMANDS(1)

0	Reserved
1	Request to Send (RTS)
2	Clear to Send (CTS)
3	End of Message Acknowledgment (EOM)
4	Request for Standardized Data
5–254	Reserved for future assignment by the SAE Subcommittee
255	Reset

1. See Appendix B.

TABLE 5 - STANDARDIZED FREE-FORMAT DATA ASSIGNMENTS(1)

0	Reserved
1	Trip Recorder Data
2	Driver Log
3	Programmable Parameters
4	Executable Code
5	Calibration Parameters
6–65535	Reserved for future assignment by the SAE Subcommittee

1. See Appendix B.

3.8 Subsystem Identification Assignments

Subsystem Identification Numbers (SIDs) are numbers assigned by the SAE staff or the SAE Truck and Bus Low Speed Communications Network Subcommittee. There are 511 SIDs definable for each controller or MID. SIDs are numbers that can be used to identify a section of a control system without a related PID. SIDs should only be assigned to field-repairable or replaceable subsystems for which failures can be detected and isolated by the controller (MID). SIDs 1 to 150 are assigned by SAE staff using the procedure in 3.10. SIDs 156 to 511 are assigned by the SAE Truck and Bus Low Speed Communications Network Subcommittee using the procedure in 3.10. MID related SIDs start with number 1 and sequentially increase. Common SIDs start at 254 and sequentially decrease.

SIDs 151 through 155 are defined as “System Diagnostic Codes” and are used to identify failures that cannot be tied to a specific field replaceable component. Specific subsystem fault isolation is the goal of any diagnostic system, but for various reasons this cannot always be accomplished. These SIDs allow the manufacturer some flexibility to communicate non-”specific component” diagnostic information. PID 194 SID/FMI format of SIDs 151–155 permit the use of standard diagnostic tools, electronic dashboards, satellite systems and other advanced devices that scan for PID 194. Because manufacturer defined codes are not desirable in terms of standardization, the use of these codes should only be used when diagnostic information cannot be communicated as a specific component and failure mode.

Possible reasons for using a System Diagnostic Code include:

a. Cost of specific component fault isolation is not justified, or

b. New concepts in Total Vehicle Diagnostics are being developed, or

c. New diagnostic strategies that are not component specific are being developed.

Due to the fact that SIDs 151–155 are manufacturer defined and are not component specific, FMIs 0–13 have little meaning. Therefore, FMI 14, “Special Instructions,” will usually be used. The goal is to refer the service personnel to the manufacturer's troubleshooting manual for more information on the particular diagnostic code.

SIDs 257 to 511 represent a second page of SIDs (page 2) for use with the page 2 extension. Bit 6 of the Diagnostic Code Character is used to denote second page SIDs as follows:

For both PIDs 194 and 196 under (b) Diagnostic code character:

b— Diagnostic code character.
Bit 6: Type of diagnostic code
1=standard diagnostic code
0=expansion diagnostic code (PID or SID from page 2)

These SIDs are transmitted modulo 256, such that SID 256 is transmitted as 0, SID 257 is transmitted as 1, etc. Page 2 SIDs are assigned in ascending order. SIDs 0, 255, and 256 are reserved.

The SID assignment list is shown in Table 7.

3.9 Failure Mode Identifier Assignments

The Failure Mode Identifier, FMI, describes the type of failure detected in the subsystem identified by the PID or SID. The FMI, and either the PID or SID combine to form a given diagnostic code (see PID 194 for added clarification). The remaining failure mode identifiers would be assigned by the SAE Truck and Bus Low Speed Communications Network Subcommittee if additional common failure modes become detectable.

The failure mode identifier assignment list is shown in Table 6.

TABLE 6 - FAILURE MODE IDENTIFIERS (FMI)

0	Data valid but above normal operational range (that is, engine overheating)
1	Data valid but below normal operational range (that is, engine oil pressure too low)
2	Data erratic, intermittent, or incorrect
3	Voltage above normal or shorted high
4	Voltage below normal or shorted low
5	Current below normal or open circuit
6	Current above normal or grounded circuit
7	Mechanical system not responding properly
8	Abnormal frequency, pulse width, or period
9	Abnormal update rate
10	Abnormal rate of change
11	Failure mode not identifiable
12	Bad intelligent device or component
13	Out of Calibration
14	Special Instructions
15	Reserved for future assignment by the SAE Subcommittee

3.10 SAE Procedure for MID, PID, and SID Assignment

a. Purpose—To outline the procedure for the assignment of MID, PID, and SID elements within the documents established in the SAE Truck and Bus Low Speed Communications Network Subcommittee.

b. General—MIDs, PIDs, and SIDs will be requested using the request form (Figure 2). All requests for MIDs, PIDs, common SIDs and MID related SIDs will be forwarded to the chairperson of the SAE Subcommittee for action at the next scheduled committee meeting. A confirmation for MID, PID, common SID and MID related SID requests will be sent to the requestor stating the date the request will be reviewed to ensure the requestor has the opportunity to be present at that meeting.

c. Verification of Request—The request form will be reviewed to ensure all required fields are provided by the requestor. If information is missing, the request form shall be returned to the requestor asking for the additional information. If the information is complete, either the MID/PID/Common SID process or the MID related SID process shall be followed depending on the type of request.

   MID/PID/Common SID Process—The chairperson of the SAE Truck and Bus Low Speed Communications Network Subcommittee will complete the request form by filling in the date and time of the next SAE Truck and Bus Low Speed Communications Network Subcommittee meeting. The chairperson will make a copy of the request form. The copy will be sent to an SAE staff member to be placed in a maintained file of requests. Send the original copy to the SAE Truck and Bus Low Speed Communications Network Subcommittee for review and approval. Send the second copy of the request back to the requestor.

   The chairperson of the SAE Subcommittee will present to the committee all MID, PID, and common SID requests since the last meeting. An approval or disapproval vote is required during the committee meeting. The chairperson of the SAE Subcommittee will document the approval or disapproval by completing the review section of the request form. These completed request forms for all MIDs, PIDs, and common SIDs will be sent to the SAE staff.

   The SAE staff will verify that all requests were handled and notify the requestor by sending a copy of the completed form to the requestor. The original form should be filed in a completed request file. The copy of the request form that is in the request file should be removed.

d. MID Related SID Process—The chairperson of the SAE Truck and Bus Low Speed Communications Network Subcommittee will keep records of SIDs allocated to each MID. This will be accomplished by maintaining a control log for each MID. If the requestor is asking for a new SID that is similar to an existing SID, the SAE staff will document the current SID on the request form and return it to the requestor. If the request is for a new MID related SID which is not currently assigned, the chairperson of the SAE Truck and Bus Low Speed Communications Network Subcommittee will present the request to the Subcommittee and if approved will assign the next sequential number. This will be documented on the request form (Figure 2). The chairperson of the SAE Truck and Bus Low Speed Communications Network Subcommittee will make a copy of the request form. The original will be returned to the requestor. The first copy will be filed in the assigned SID file by MID. The new SID number will be logged on the MID/SID control log for that MID.

NOTE: Parameters considered to be of a data link command or control nature should be added to the parameter list at the lowest PID value available within the appropriate data size grouping. All other parameters should be added at the highest PID value available within the appropriate data grouping.

J1587 SAE Control and Communications Subcommittee
MID/PID/SID Request Form

Requester Name: _____ Meeting Date: _____
Company Name: _____
Requester Address: _____ Phone # _____ Email _____

Request Type: MID _____ PID _____
SID _____ Requested for MID # _____

Description of MID/PID/SID:

_____

For PIDs Only (See SAE J1587 for Description)

Parameter Data Length _____
Data Type _____
Bit Resolution _____
Maximum Range _____
Transmission Update Period _____
Message Priority _____
Format _____

_____

_____

For USE by SAE Only

Approved _____ Disapproved _____ Signature _____
New MID Number _____ New PID Number _____ New SID Number _____
Current MID _____ Current PID _____ Current SID _____

Date of next SAE Data Format Committee meeting: _____
Location: _____ Time: _____

Incomplete Information: _____ (Please complete items marked)

Please e-mail the completed form to the SAE Truck and Bus - Low Speed Communication Network Subcommittee chairperson.
-or-
Mail the completed form to:
SAE Truck and Bus Low Speed Communications Network Subcommittee
400 Commonwealth Drive
Warrendale, PA 15096

FIGURE 2 - SAE SUBCOMMITTEE MID, PID, SID REQUEST FORM

TABLE 7 - SUBSYSTEM IDENTIFICATION (SID) ASSIGNMENT LIST

SIDs 1 to 150 are not common with other systems and are assigned by SAE. SIDs 151 to 255 are common among other systems and are assigned by the Subcommittee.

151	System Diagnostic Code #1
152	System Diagnostic Code #2
153	System Diagnostic Code #3
154	System Diagnostic Code #4
155	System Diagnostic Code #5

Common SIDs

156-202	Reserved for future assignment by SAE
203	Door Switch
204	Diagnostics Data Available Through Alternate Reporting Method (Not PID 194, 195, 196 faults from page 1 or 2)
205	J1939 Network #3
206	J1939 Network #2
207	Battery #1 Temperature
208	Battery #2 Temperature
209	Start Enable Device #2
210	Oil Temperature Sensor
211	Sensor Supply Voltage #2 (+5V DC)
212	Sensor Supply Voltage #1 (+5V DC)
213	PLC Data Link
214	ECU Backup Battery
215	Cab Interior Temperature Thermostat
216	Other ECUs Have Reported Fault Codes Affecting Operation
217	Anti-theft Start Inhibit (Password Valid Indicator)
218	ECM Main Relay
219	Start Signal Indicator
220	Electronic Tractor/Trailer Interface (ISO 11992)
221	Internal Sensor Voltage Supply
222	Protect Lamp
223	Ambient Light Sensor
224	Audible Alarm
225	Green Lamp
226	Transmission Neutral Switch
227	Auxiliary Analog Input #1
228	High Side Refrigerant Pressure Switch
229	Kickdown Switch
230	Idle Validation Switch
231	SAE J1939 Data Link
232	5 Volts DC Supply
233	Controller #2
234	Parking Brake On Actuator
235	Parking Brake Off Actuator
236	Power Connect Device
237	Start Enable Device
238	Diagnostic Lamp—Red
239	Diagnostic Light—Amber

TABLE 7 - SUBSYSTEM IDENTIFICATION (SID) ASSIGNMENT LIST (CONTINUED)

240	Program Memory
241[(1)]	Set aside for Systems Diagnostics
242	Cruise Control Resume Switch
243	Cruise Control Set Switch
244	Cruise Control Enable Switch
245	Clutch Pedal Switch #1
246	Brake Pedal Switch #1
247	Brake Pedal Switch #2
248	Proprietary Data Link
249	SAE J1922 Data Link
250	SAE J1708 (SAE J1587) Data Link
251	Power Supply
252	Calibration Module
253	Calibration Memory
254	Controller #1
255	Reserved

Engine SIDs (MID = 128, 175, 183, 184, 185, 186)

(modulo 256 value identified in parentheses)

0	Reserved
1	Injector Cylinder #1
2	Injector Cylinder #2
3	Injector Cylinder #3
4	Injector Cylinder #4
5	Injector Cylinder #5
6	Injector Cylinder #6
7	Injector Cylinder #7
8	Injector Cylinder #8
9	Injector Cylinder #9
10	Injector Cylinder #10
11	Injector Cylinder #11
12	Injector Cylinder #12
13	Injector Cylinder #13
14	Injector Cylinder #14
15	Injector Cylinder #15
16	Injector Cylinder #16
17	Fuel Shutoff Valve #1
18	Fuel Control Valve
19	Throttle Bypass Valve
20	Timing Actuator
21	Engine Position Sensor
22	Timing Sensor
23	Rack Actuator
24	Rack Position Sensor
25	External Engine Protection Input #1
26	Auxiliary Output Device Driver #1
27	Variable Geometry Turbocharger Actuator #1
28	Variable Geometry Turbocharger Actuator #2

TABLE 7 - SUBSYSTEM IDENTIFICATION (SID) ASSIGNMENT LIST (CONTINUED)

29	External Fuel Command Input
30	External Speed Command Input
31	Tachometer Signal Output
32	Turbocharger #1 Wastegate Drive
33	Fan Clutch Output Device Driver
34	Exhaust Back Pressure Sensor
35	Exhaust Back Pressure Regulator Solenoid
36	Glow Plug Lamp
37	Electronic Drive Unit Power Relay
38	Glow Plug Relay
39	Engine Starter Motor Relay
40	Auxiliary Output Device Driver #2
41	ECM 8 Volts DC Supply
42	Injection Control Pressure Regulator
43	Autoshift High Gear Actuator
44	Autoshift Low Gear Actuator
45	Autoshift Neutral Actuator
46	Autoshift Common Low Side (Return)
47	Injector Cylinder #17
48	Injector Cylinder #18
49	Injector Cylinder #19
50	Injector Cylinder #20
51	Auxiliary Output Device Driver #3
52	Auxiliary Output Device Driver #4
53	Auxiliary Output Device Driver #5
54	Auxiliary Output Device Driver #6
55	Auxiliary Output Device Driver #7
56	Auxiliary Output Device Driver #8
57	Auxiliary PWM Driver #1
58	Auxiliary PWM Driver #2
59	Auxiliary PWM Driver #3
60	Auxiliary PWM Driver #4
61	Variable Swirl System Valve
62	Prestroke Sensor
63	Prestroke Actuator
64	Engine Speed Sensor #2
65	Heated Oxygen Sensor
66	Ignition Control Mode Signal
67	Ignition Control Timing Signal
68	Secondary Turbo Inlet Pressure
69	After Cooler-Oil Cooler Coolant Temperature
70	Inlet Air Heater Driver #1
71	Inlet Air Heater Driver #2
72	Injector Cylinder #21
73	Injector Cylinder #22
74	Injector Cylinder #23
75	Injector Cylinder #24
76	Knock Sensor
77	Gas Metering Valve

TABLE 7 - SUBSYSTEM IDENTIFICATION (SID) ASSIGNMENT LIST (CONTINUED)

78	Fuel Supply Pump Actuator
79	Engine (Compression) Brake Output #1
80	Engine (Compression) Brake Output #2
81	Engine (Exhaust) Brake Output
82	Engine (Compression) Brake Output #3
83	Fuel Control Valve #2
84	Timing Actuator #2
85	Engine Oil Burn Valve
86	Engine Oil Replacement Valve
87	Idle Shutdown Vehicle Accessories Relay Driver
88	Turbocharger #2 Wastegate Drive
89	Air Compressor Actuator Circuit
90	Engine Cylinder #1 Knock Sensor
91	Engine Cylinder #2 Knock Sensor
92	Engine Cylinder #3 Knock Sensor
93	Engine Cylinder #4 Knock Sensor
94	Engine Cylinder #5 Knock Sensor
95	Engine Cylinder #6 Knock Sensor
96	Engine Cylinder #7 Knock Sensor
97	Engine Cylinder #8 Knock Sensor
98	Engine Cylinder #9 Knock Sensor
99	Engine Cylinder #10 Knock Sensor
100	Engine Cylinder #11 Knock Sensor
101	Engine Cylinder #12 Knock Sensor
102	Engine Cylinder #13 Knock Sensor
103	Engine Cylinder #14 Knock Sensor
104	Engine Cylinder #15 Knock Sensor
105	Engine Cylinder #16 Knock Sensor
106	Engine Cylinder #17 Knock Sensor
107	Engine Cylinder #18 Knock Sensor
108	Engine Cylinder #19 Knock Sensor
109	Engine Cylinder #20 Knock Sensor
110	Engine Cylinder #21 Knock Sensor
111	Engine Cylinder #22 Knock Sensor
112	Engine Cylinder #23 Knock Sensor
113	Engine Cylinder #24 Knock Sensor
114	Multiple Unit Synchronization Switch
115	Engine Oil Change Interval
116	Engine was Shut Down Hot
117	Engine has been Shut Down from Data Link Information
118	Injector Needle Lift Sensor #1
119	Injector Needle Lift Sensor #2
120	Coolant System Thermostat
121	Engine Automatic Start Alarm
122	Engine Automatic Start Lamp
123	Engine Automatic Start Safety Interlock Circuit
124	Engine Automatic Start Failed (Engine)
125	Fuel Heater Driver Signal
126	Fuel Pump Pressurizing Assembly #1

TABLE 7 - SUBSYSTEM IDENTIFICATION (SID) ASSIGNMENT LIST (CONTINUED)

127	Fuel Pump Pressurizing Assembly #2
128	Starter Solenoid Lockout Relay Driver Circuit
129	Cylinder #1 Exhaust Gas Port Temperature
130	Cylinder #2 Exhaust Gas Port Temperature
131	Cylinder #3 Exhaust Gas Port Temperature
132	Cylinder #4 Exhaust Gas Port Temperature
133	Cylinder #5 Exhaust Gas Port Temperature
134	Cylinder #6 Exhaust Gas Port Temperature
135	Cylinder #7 Exhaust Gas Port Temperature
136	Cylinder #8 Exhaust Gas Port Temperature
137	Cylinder #9 Exhaust Gas Port Temperature
138	Cylinder #10 Exhaust Gas Port Temperature
139	Cylinder #11 Exhaust Gas Port Temperature
140	Cylinder #12 Exhaust Gas Port Temperature
141	Cylinder #13 Exhaust Gas Port Temperature
142	Cylinder #14 Exhaust Gas Port Temperature
143	Cylinder #15 Exhaust Gas Port Temperature
144	Cylinder #16 Exhaust Gas Port Temperature
145	Adaptive Cruise Control Mode
146	Exhaust Gas Recirculation (EGR) Valve #1 Mechanism
147	Variable Nozzle Turbocharger (VNT) Mechanism
148	Engine (Compression) Brake Output #4
149	Engine (Compression) Brake Output #5
150	Engine (Compression) Brake Output #6
256 (0)	Reserved
257 (1)	Auxiliary output device driver # 9
258 (2)	Auxiliary output device driver # 10
259 (3)	Auxiliary output device driver # 11
260 (4)	Auxiliary output device driver # 12
261 (5)	Auxiliary output device driver # 13
262 (6)	Auxiliary output device driver # 14
263 (7)	Auxiliary output device driver # 15
264 (8)	Auxiliary output device driver # 16
265 (9)	Auxiliary output device driver # 17
266 (10)	Exhaust Gas Recirculation (EGR) Valve #2 Mechanism
267 (11)	Auxiliary PWM Driver #5
268 (12)	Auxiliary PWM Driver #6
269 (13)	Turbocharger Nozzle Position Sensor
270 (14)	Turbocharger Compressor Discharge Temperature Sensor
271 (15)	Charge Air Cooler Bypass Control
272 (16)	Charge Air Cooler Air Outlet Temperature Sensor
273 (17)	Charge Air Cooler Air Outlet Pressure Sensor
274 (18)	Combustion Air Humidity Sensor
275 (19)	Auxiliary Engine Cooling System Control Output
276 (20)	Inlet Air Pre-Cleaner Control Output
277 (21)	Exhaust Gas Recirculation (EGR) Mass Flow Sensor
278 (22)	Fuel Shutoff Valve #2
279 (23)	Fuel Leakage Sensor #1
280 (24)	Fuel Leakage Sensor #2

TABLE 7 - SUBSYSTEM IDENTIFICATION (SID) ASSIGNMENT LIST (CONTINUED)

281 (25)	Exhaust Gas Recirculation (EGR) Check Valve(s)
282 (26)	Exhaust Gas Recirculation (EGR) Cooler
283 (27)	Intake Valve Actuation System Oil Pressure Control Valve
284 (28)	Engine Coolant Diverter Valve
285 (29)	Intake Valve Actuator #1
286 (30)	Intake Valve Actuator #2
287 (31)	Intake Valve Actuator #3
288 (32)	Intake Valve Actuator #4
289 (33)	Intake Valve Actuator #5
290 (34)	Intake Valve Actuator #6
291 (35)	Intake Valve Actuator #7
292 (36)	Intake Valve Actuator #8
293 (37)	Intake Valve Actuator #9
294 (38)	Intake Valve Actuator #10
295 (39)	Intake Valve Actuator #11
296 (40)	Intake Valve Actuator #12
297 (41)	Intake Valve Actuator #13
298 (42)	Intake Valve Actuator #14
299 (43)	Intake Valve Actuator #15
300 (44)	Intake Valve Actuator #16
301 (45)	Intake Valve Actuator #17
302 (46)	Intake Valve Actuator #18
303 (47)	Intake Valve Actuator #19
304 (48)	Intake Valve Actuator #20
305 (49)	Gas Control Valve # 1 Outlet Pressure (Natural Gas)
306 (50)	Engine Coolant # 2 Pressure #1
307 (51)	Mixer Inlet Relative Humidity
308 (52)	Fuel Rack Position # 2
309 (53)	Turbocharger Compressor Outlet # 1 Pressure
310 (54)	Waste Engine Oil Reservoir Level
311 (55)	Engine Oil Level # 2 Remote Reservoir
312 (56)	Coolant Level # 2
313 (57)	Injector Cylinder, Multiple
314 (58)	Turbocharger #1 Compressor Inlet Pressure (absolute)
315 (59)	External Engine Protection Input #2
316 (60)	Service Indication Lamp
317 (61)	Injector Supply Voltage
318 (62)	Particulate Trap Intake Gas Temperature Bank 1
319 (63)	Particulate Trap Intake Gas Temperature Bank 2
320 (64)	Particulate Trap Outlet Gas Temperature Bank 1
321 (65)	Particulate Trap Outlet Gas Temperature Bank 2
322 (66)	Particulate Trap Intermediate Gas Temperature Bank 1
323 (67)	Particulate Trap Intermediate Gas Temperature Bank 2
324 (68)	Particulate Trap Differential Pressure Bank 1
325 (69)	Particulate Trap Differential Pressure Bank 2
326 (70)	Exhaust Gas Temperature 1
327 (71)	Exhaust Gas Temperature 2
328 (72)	Exhaust Gas Temperature 3
329 (73)	Exhaust Gas Temperature 1 Bank 2

TABLE 7 - SUBSYSTEM IDENTIFICATION (SID) ASSIGNMENT LIST (CONTINUED)

330 (74)	Exhaust Gas Temperature 2 Bank 2
331 (75)	Exhaust Gas Temperature 3 Bank 2
332 (76)	Aftertreatment #1 Fuel Pressure
333 (77)	Aftertreatment #1 Fuel Pressure Control Actuator
334 (78)	Aftertreatment #1 Fuel Enable Actuator
335 (79)	Aftertreatment #1 Ignition
336 (80)	Aftertreatment #2 Fuel Pressure
337 (81)	Aftertreatment #2 Fuel Pressure Control Actuator
338 (82)	Aftertreatment #2 Fuel Enable Actuator
339 (83)	Aftertreatment #2 Ignition
340 (84)	Aftertreatment #1 Air Enable Actuator
341 (85)	Aftertreatment #1 Purge Air Actuator
342 (86)	Aftertreatment #1 Atomization Air Actuator
343 (87)	Aftertreatment #1 Air System Relay
344 (88)	Aftertreatment #2 Air Enable Actuator
345 (89)	Aftertreatment #2 Purge Air Actuator
346 (90)	Aftertreatment #2 Atomization Air Actuator
347 (91)	Aftertreatment #2 Air System Relay
348 (92)	Aftertreatment #1 Supply Air Pressure
349 (93)	Aftertreatment #1 Purge Air Pressure
350 (94)	Aftertreatment #1 Air Pressure Control Actuator
351 (95)	Aftertreatment #1 Air Pressure Actuator Position
352 (96)	Aftertreatment #2 Supply Air Pressure
353 (97)	Aftertreatment #2 Purge Air Pressure
354 (98)	Aftertreatment #2 Air Pressure Control Actuator
355 (99)	Aftertreatment #2 Air Pressure Actuator Position
356 (100)	Aftertreatment #1 Failed to Ignite
357 (101)	Aftertreatment #1 Loss of Ignition
358 (102)	Aftertreatment #2 Failed to Ignite
359 (103)	Aftertreatment #2 Loss of Ignition
360 (104)	Aftertreatment #1 Regeneration Manually Disabled
361 (105)	Aftertreatment #2 Regeneration Manually Disabled
362 (106)	Injector Cylinder #1, Actuator #2
363 (107)	Injector Cylinder #2, Actuator #2
364 (108)	Injector Cylinder #3, Actuator #2
365 (109)	Injector Cylinder #4, Actuator #2
366 (110)	Injector Cylinder #5, Actuator #2
367 (111)	Injector Cylinder #6, Actuator #2
368 (112)	Injector Cylinder #7, Actuator #2
369 (113)	Injector Cylinder #8, Actuator #2
370 (114)	Aftertreatment #1 Particulate Trap Intake Pressure
371 (115)	Aftertreatment #1 Particulate Trap Outlet Pressure
372 (116)	Ambient Air Density
373 (117)	Aftertreatment #1 Secondary Air Differential Pressure
374 (118)	Aftertreatment #2 Secondary Air Differential Pressure
375 (119)	Aftertreatment #1 Secondary Air Temperature
376 (120)	Aftertreatment #2 Secondary Air Temperature
377 (121)	Aftertreatment #1 Secondary Air Pressure
378 (122)	Aftertreatment #2 Secondary Air Pressure

TABLE 7 - SUBSYSTEM IDENTIFICATION (SID) ASSIGNMENT LIST (CONTINUED)

379 (123)	Oil Scavenge Pump
380 (124)	Catalyst 1 System Monitor
381 (125)	Aftertreatment 1 Fuel Drain Actuator
382 (126)	Aftertreatment 1 Fuel Injector 1
383 (127)	Particulate Matter Trap Monitor
384 (128)	Engine Turbocharger 1 Turbine Inlet Temperature
385 (129)	Accelerator Pedal #1 Channel 2
386 (130)	Aftertreatment #1 Purge Air Pressure
387 (131)	Aftertreatment #1 Secondary Air Mass Flow
388 (132)	Particulate Trap Active Regeneration Inhibited Due to Permanent System Lockout
389 (133)	Aftertreatment 1 Fuel Rate
390 (134)	Particulate Trap Active Regeneration Inhibited Status
391 (135)	Engine Exhaust Gas Recirculation (EGR) System Monitor
392 (136)	Engine Injector Bank 1
393 (137)	Particulate Trap Active Regeneration Inhibited Due to Inhibit Switch
394 (138)	Particulate Trap Active Regeneration Inhibited Due to Temporary System Lockout
395 (139)	Engine Air Shutoff Command Status
396 (140)	Aftertreatment 1 Ignition Transformer Secondary Output
397-511	Reserved for future assignment by SAE

Transmission SIDs (MID = 130, 176, 223)

0	Reserved
1	C1 Solenoid Valve
2	C2 Solenoid Valve
3	C3 Solenoid Valve
4	C4 Solenoid Valve
5	C5 Solenoid Valve
6	C6 Solenoid Valve
7	Lockup Solenoid Valve
8	Forward Solenoid Valve
9	Low Signal Solenoid Valve
10	Retarder Enable Solenoid Valve
11	Retarder Modulation Solenoid Valve
12	Retarder Response Solenoid Valve
13	Differential Lock Solenoid Valve
14	Engine/Transmission Match
15	Retarder Modulation Request Sensor
16	Neutral Start Output
17	Turbine Speed Sensor
18	Primary Shift Selector
19	Secondary Shift Selector
20	Special Function Inputs
21	C1 Clutch Pressure Indicator
22	C2 Clutch Pressure Indicator
23	C3 Clutch Pressure Indicator
24	C4 Clutch Pressure Indicator
25	C5 Clutch Pressure Indicator

TABLE 7 - SUBSYSTEM IDENTIFICATION (SID) ASSIGNMENT LIST (CONTINUED)

26	C6 Clutch Pressure Indicator
27	Lockup Clutch Pressure Indicator
28	Forward Range Pressure Indicator
29	Neutral Range Pressure Indicator
30	Reverse Range Pressure Indicator
31	Retarder Response System Pressure Indicator
32	Differential Lock Clutch Pressure Indicator
33	Multiple Pressure Indicators
34	Reverse Switch
35	Range High Actuator
36	Range Low Actuator
37	Splitter Direct Actuator
38	Splitter Indirect Actuator
39	Shift Finger Rail Actuator 1
40	Shift Finger Gear Actuator 1
41	Upshift Request Switch
42	Downshift Request Switch
43	Torque Converter Interrupt Actuator
44	Torque Converter Lockup Actuator
45	Range High Indicator
46	Range Low Indicator
47	Shift Finger Neutral Indicator
48	Shift Finger Engagement Indicator
49	Shift Finger Center Rail Indicator
50	Shift Finger Rail Actuator 2
51	Shift Finger Gear Actuator 2
52	Hydraulic System
53	Defuel Actuator
54	Inertia Brake Actuator
55	Clutch Actuator
56	Auxiliary Range Mechanical System
57	Shift Console Data Link
58	Main Box Shift Engagement System
59	Main Box Rail Selection System
60	Main Box Shift Neutralization System
61	Auxiliary Splitter Mechanical System
62	Transmission Controller Power Relay
63	Output Shaft Speed Sensor
64	Throttle Position Device
65–150	Reserved for future assignment by SAE

Brake SIDs (MIDs = 136, 137, 138, 139, 246, 247)

0	Reserved
1	Wheel Sensor ABS Axle 1 Left
2	Wheel Sensor ABS Axle 1 Right
3	Wheel Sensor ABS Axle 2 Left
4	Wheel Sensor ABS Axle 2 Right
5	Wheel Sensor ABS Axle 3 Left
6	Wheel Sensor ABS Axle 3 Right

TABLE 7 - SUBSYSTEM IDENTIFICATION (SID) ASSIGNMENT LIST (CONTINUED)

7	Pressure Modulation Valve ABS Axle 1 Left
8	Pressure Modulation Valve ABS Axle 1 Right
9	Pressure Modulation Valve ABS Axle 2 Left
10	Pressure Modulation Valve ABS Axle 2 Right
11	Pressure Modulation Valve ABS Axle 3 Left
12	Pressure Modulation Valve ABS Axle 3 Right
13	Retarder Control Relay
14	Relay Diagonal 1
15	Relay Diagonal 2
16	Mode Switch ABS
17	Mode Switch ASR
18	DIF 1—ASR Valve
19	DIF 2—ASR Valve
20	Pneumatic Engine Control
21	Electronic Engine Control (Servomotor)
22	Speed Signal Input
23	Tractor ABS Warning Light Bulb
24	ASR Light Bulb
25	Wheel Sensor, ABS Axle 1 Average
26	Wheel Sensor, ABS Axle 2 Average
27	Wheel Sensor, ABS Axle 3 Average
28	Pressure Modulator, Drive Axle Relay Valve
29	Pressure Transducer, Drive Axle Relay Valve
30	Master Control Relay
31	Trailer Brake Slack Out of Adjustment Forward Axle Left
32	Trailer Brake Slack Out of Adjustment Forward axle Right
33	Trailer Brake Slack Out of Adjustment Rear Axle Left
34	Trailer Brake Slack Out of Adjustment Rear Axle Right
35	Tractor Brake Slack Out of Adjustment Axle 1 Left
36	Tractor Brake Slack Out of Adjustment Axle 1 Right
37	Tractor Brake Slack Out of Adjustment Axle 2 Left
38	Tractor Brake Slack Out of Adjustment Axle 2 Right
39	Tractor Brake Slack Out of Adjustment Axle 3 Left
40	Tractor Brake Slack Out of Adjustment Axle 3 Right
41	Ride Height Relay
42	Hold Modulator Valve Solenoid Axle 1 Left
43	Hold Modulator Valve Solenoid Axle 1 Right
44	Hold Modulator Valve Solenoid Axle 2 Left
45	Hold Modulator Valve Solenoid Axle 2 Right
46	Hold Modulator Valve Solenoid Axle 3 Left
47	Hold Modulator Valve Solenoid Axle 3 Right
48	Dump Modulator Valve Solenoid Axle 1 Left
49	Dump Modulator Valve Solenoid Axle 1 Right
50	Dump Modulator Valve Solenoid Axle 2 Left
51	Dump Modulator Valve Solenoid Axle 2 Right
52	Dump Modulator Valve Solenoid Axle 3 Left
53	Dump Modulator Valve Solenoid Axle 3 Right
54	Hydraulic Pump Motor
55	Brake Light Switch 1

TABLE 7 - SUBSYSTEM IDENTIFICATION (SID) ASSIGNMENT LIST (CONTINUED)

56	Brake Light Switch 2
57	Electronic Pressure Control, Axle 1
58	Pneumatic Back-up Pressure Control, Axle 1
59	Brake Pressure Sensing, Axle 1
60	Electronic Pressure Control, Axle 2
61	Pneumatic Back-up Pressure Control, Axle 2
62	Brake Pressure Sensing, Axle 2
63	Electronic Pressure Control, Axle 3
64	Pneumatic Back-up Pressure Control, Axle 3
65	Brake Pressure Sensing, Axle 3
66	Electronic Pressure Control, Trailer Control
67	Pneumatic Back-up Pressure Control, Trailer Control
68	Brake Pressure Sensing, Trailer Control
69	Axle Load Sensor
70	Lining Wear Sensor, Axle 1 Left
71	Lining Wear Sensor, Axle 1 Right
72	Lining Wear Sensor, Axle 2 Left
73	Lining Wear Sensor, Axle 2 Right
74	Lining Wear Sensor, Axle 3 Left
75	Lining Wear Sensor, Axle 3 Right
76	Brake Signal Transmitter
77	Brake Signal Sensor 1
78	Brake Signal Sensor 2
79	Tire Dimension Supervision
80	Vehicle Deceleration Control
81	Trailer ABS Warning Light Bulb
82	Brake Torque Output Axle 1 Left
83	Brake Torque Output Axle 1 Right
84	Brake Torque Output Axle 2 Left
85	Brake Torque Output Axle 2 Right
86	Brake Torque Output Axle 3 Left
87	Brake Torque Output Axle 3 Right
88	Vehicle Dynamic Stability Control System (VDC)
89	Steering Angle Sensor
90	Voltage Supply for Stability Control System
91	Brake Lining Display
92	Pressure Limitation Valve
93	Auxiliary Valve
94	Hill holder System
95	Voltage Supply, Lining Wear Sensors, Axle 1
96	Voltage Supply, Lining Wear Sensors, Axle 2
97	Voltage Supply, Lining Wear Sensors, Axle 3
98	Reference Ground Connection
99	Lateral Accelerometer
100	Brake Light Relay
101	Brake Warning Light Bulb
102	Differential Lock control output (transfer case)
103	Yaw Rate Sensor
104	Service Odometer

TABLE 7 - SUBSYSTEM IDENTIFICATION (SID) ASSIGNMENT LIST (CONTINUED)

105–150	Reserved for future assignment by SAE

Instrument Panel SIDs (MID = 140, 234)

0	Reserved
1	Left Fuel Level Sensor
2	Right Fuel Level Sensor
3	Fuel Feed Rate Sensor
4	Fuel Return Rate Sensor
5	Tachometer Gauge Coil
6	Speedometer Gauge Coil
7	Turbocharger Air Pressure Gauge Coil
8	Fuel Pressure Gauge Coil
9	Fuel Level Gauge Coil
10	Second Fuel Level Gauge Coil
11	Engine Oil Pressure Gauge Coil
12	Engine Oil Temperature Gauge Coil
13	Engine Coolant Temperature Gauge Coil
14	Pyrometer Gauge Coil
16	Transmission Oil Pressure Gauge Coil
15	Transmission Oil Temperature Gauge Coil
17	Forward Rear Axle Temperature Gauge Coil
18	Rear Rear Axle Temperature Gauge Coil
19	Voltmeter Gauge Coil
20	Primary Air Pressure Gauge Coil
21	Secondary Air Pressure Gauge Coil
22	Ammeter Gauge Coil
23	Air Application Gauge Coil
24	Air Restriction Gauge Coil
25–150	Reserved for future assignment by SAE

Vehicle Management SIDs (MID = 142, 187, 188)

0	Reserved
1	Timing Sensor
2	Timing Actuator
3	Fuel Rack Position Sensor
4	Fuel Rack Actuator
5	Oil Level Indicator Output
6	Tachometer Drive Output
7	Speedometer Drive Output
8	PWM Input (ABS/ASR)
9	PWM Output
10	Auxiliary Output #1
11	Auxiliary Output #2
12	Auxiliary Output #3
13	Auxiliary Output #4
14	Auxiliary Output #5
15	Power Relay Control Output
16	“Neutral” Power Relay Control Output
17	Starter Relay Control Output

TABLE 7 - SUBSYSTEM IDENTIFICATION (SID) ASSIGNMENT LIST (CONTINUED)

18	Transmission Shift Control Valve #1 Output
19	Transmission Shift Control Valve #2 Output
20	Differential Lock Control Valve #1 Output
21	Differential Lock Control Valve #2 Output
22	Windshield Wiper ON Relay Control Output
23	Windshield Wiper Speed Select Output
24	Mirror Heat Control Output
25	Driver Door “Lock” Output
26	Driver Door “Unlock” Output
27	Switch Diagnostic Output
28	Horn Control Output
29	“Wake Up” Output
30	Interior Lamps Output
31	Fan Override Indicator Lamp Output
32	Low Air Pressure Indicator Relay Output
33	Maintenance Lamp Output
34	Battery Monitor Load #1 Control Output
35	Battery Monitor Load #2 Control Output
36	Headlamp Low Beam Left #1 Output
37	Headlamp Low Beam Left #2 Output
38	Headlamp Low Beam Right #1 Output
39	Headlamp Low Beam Right #2 Output
40–150	Reserved for future assignment by SAE

Fuel System SIDs (MID = 143)

0	Reserved
1	Injector Cylinder #1
2	Injector Cylinder #2
3	Injector Cylinder #3
4	Injector Cylinder #4
5	Injector Cylinder #5
6	Injector Cylinder #6
7	Injector Cylinder #7
8	Injector Cylinder #8
9	Injector Cylinder #9
10	Injector Cylinder #10
11	Injector Cylinder #11
12	Injector Cylinder #12
13	Injector Cylinder #13
14	Injector Cylinder #14
15	Injector Cylinder #15
16	Injector Cylinder #16
17	Fuel Shutoff Valve
18	Fuel Control Valve
19	Throttle Bypass Valve
20	Timing Actuator
21	Engine Position Sensor
22	Timing Sensor
23	Rack Actuator

TABLE 7 - SUBSYSTEM IDENTIFICATION (SID) ASSIGNMENT LIST (CONTINUED)

24	Rack Position Sensor
25	External Engine Protection Input
26	Auxiliary Output Device Driver
27	Cooling Fan Drive Output
28	Engine (Compression) Brake Output #1
29	Engine (Compression) Brake Output #2
30	Engine (Exhaust) Brake Output
31	Pressure Control Valve #1
32	Pressure Control Valve #2
33–150	Reserved for future assignment by SAE

Cab Climate Control SIDs (MID = 146, 200)

1	HVAC Unit Discharge Temperature Sensor
2	Evaporator Temperature Sensor
3	Solar Load Sensor #1
4	Solar Load Sensor #2
5	Fresh/Recirculation Air Intake Door Actuator
6	Mode Door #1 Actuator
7	Mode Door #2 Actuator
8	Mode Door #3 Actuator
9	Blend Door Actuator
10	Blower Motor
11	A/C Clutch Relay
12	Water Valve
13	Heater Exchanger Temperature Sensor
14	In Cabin Temperature Sensor Blower
15	Blower Clutch
16	Stepper Motor Phase 1
17	Stepper Motor Phase 2
18	Stepper Motor Phase 3
19	Stepper Motor Phase 4
20	Refrigerant Evaporator Inlet Temperature Sensor
21	Refrigerant Evaporator Outlet Temperature Sensor
22	Refrigerant Evaporator Inlet Pressure Sensor
23	Refrigerant Evaporator Outlet Pressure Sensor
24	Refrigerant Compressor Inlet Temperature Sensor
25	Refrigerant Compressor Outlet Temperature Sensor
26	Refrigerant Compressor Inlet Pressure Sensor
27	Refrigerant Compressor Outlet Pressure Sensor
28	Refrigerant Condenser Outlet Temperature Sensor
29	Refrigerant Condenser Outlet Pressure Sensor
30	Climate Control Air Filter Differential Pressure Sensor
31-150	Reserved for future assignment by SAE

Suspension SIDs (MID = 150, 151)

0	Reserved
1	Solenoid Valve Axle 1 Right
2	Solenoid Valve Axle 1 Left
3	Solenoid Valve Axle 2 Right

TABLE 7 - SUBSYSTEM IDENTIFICATION (SID) ASSIGNMENT LIST (CONTINUED)

4	Solenoid Valve Axle 2 Left
5	Solenoid Valve Axle 3 Right
6	Solenoid Valve Axle 3 Left
7	Solenoid Valve Central (Lowering/Lifting Control)
8	Solenoid Valve for Lifting the Lifting/Trailing Axle
9	Solenoid Valve for Lowering the Lifting/Trailing Axle
10	Solenoid Valve for Control of the Lift Bellow
11	Solenoid Valve for Starting Lock
12	Solenoid Valve for Door Release
13	Solenoid Valve for Mainflow Throttle
14	Solenoid Valve for Transverse Lock/Throttle
15	Solenoid Valve for Automatic Load-Dependent Brake-Power Balance
16	Height Sensor Axle 1 Right
17	Height Sensor Axle 1 Left
18	Height Sensor Axle 2 Right
19	Height Sensor Axle 2 Left
20	Height Sensor Axle 3 Right
21	Height Sensor Axle 3 Left
22	Pressure Sensor Axle 1 Right
23	Pressure Sensor Axle 1 Left
24	Pressure Sensor Axle 2 Right
25	Pressure Sensor Axle 2 Left
26	Pressure Sensor Axle 3 Right
27	Pressure Sensor Axle 3 Left
28	Pressure Sensor Lift Bellow
29	Sidewalk Detector Sensor
30	Switch for Maximum Permanent Permissible Pressure
31	Switch for Maximum Temporary Permissible Pressure
32	Speed Signal Input
33	Remote Control Unit #1
34	Central Valve Relay
35	Auxiliary Tank Control
36	Exterior Kneel (warning lamp and audible alarm)
37	Wheel Chair Lift Inhibit
38	Checksum ECU Specific Data
39	Checksum Parameter Data
40	Checksum Calibration Data Level Sensors
41	Checksum Calibration Data Pressure Sensors
42	Checksum Maximum Axle Load Data
43	Central 3/2 Solenoid Valve Axle 3
44	Central 3/2 Solenoid Valve Front Axle
45	Pressure Sensor Brake Pressure
46	Power Supply for Pressure Sensors
47	Power Supply for Remote Controls
48	Remote Control #1 Data Line
49	Remote Control #1 Clock Line
50	Remote Control #2 Data Line
51	Remote Control #2 Clock Line
52	Remote Control Unit #2

TABLE 7 - SUBSYSTEM IDENTIFICATION (SID) ASSIGNMENT LIST (CONTINUED)

53	Power Supply for Solenoid Valves
54	Proportional Valve Front Axle Left
55	Proportional Valve Front Axle Right
56	Proportional Valve Drive Axle Left
57	Proportional Valve Drive Axle Right
58	Proportional Valve Axle 3 Left
59	Proportional Valve Axle 3 Right
60–150	Reserved for future assignment by SAE

Park Brake Controller SIDs (MID = 157)

0	Reserved
1	Pressure Sender #1
2	Pressure Sender #2
3	Solenoid Control #1
4	Solenoid Control #2
5	Solenoid Control #3
6	Solenoid Control #4
7	Operator Control Switch #1 (input)
8	Operator Control Switch #2 (input)
9	Operator Station
10	Passenger Station
11	Interior Station
12	Exterior Station
13	Light Sequence Control
14	Warning light #1
15	Warning light #2
16	Speed Sense Comparator
17	Series Latch Monitor
18	Expansion ECU Station
19	Aux Switch Input #1
20	Aux Switch Input #2
21	Diagnostic Input
22	Aux Data Link (I2C)
23	Solenoid Supply #1
24	Solenoid Supply #2
25	Solenoid Supply #3
26	Solenoid Supply #4
27	Operator Control Switch #1 (output)
28	Operator Control Switch #2 (output)
29	Operator Control Switch Aux
30	Aux Output #1
31	Aux Output # 2
32	Aux Output # 3
33	Aux Output # 4
34	Aux Output # 5
35	Aux Output # 6
36	Aux Output # 7
37	Diagnostic Output
38	Pressure Control Modulator

TABLE 7 - SUBSYSTEM IDENTIFICATION (SID) ASSIGNMENT LIST (CONTINUED)

39	Series Latch Control
40	Brownout Voltage Sequence Control
41-150	Reserved for future assignment by SAE

Vehicle Navigation SIDs (MID = 162, 191)

0	Reserved
1	Dead Reckoning Unit
2	Loran Receiver
3	Global Positioning System (GPS)
4	Integrated Navigation Unit
5–150	Reserved for future assignment by SAE

Vehicle Security SIDs (MID = 163)

0	Reserved
1	Transceiver Antenna
2	Security Transponder
3–150	Reserved for future assignment by SAE

Tire SIDs (MID = 166, 167, 168, 169, 186)

0	Reserved
1	Operator Control Panel (OCP)
2	Pneumatic Control Unit (PCU)
3	PCU Steer Solenoid
4	PCU Drive Solenoid
5	PCU Solenoid Trailer #1, Tag #1, or Push #1
6	PCU Supply Solenoid
7	PCU Control Solenoid
8	PCU Deflate Solenoid
9	Pneumatic—Steer Channel
10	Pneumatic—Drive Channel
11	Pneumatic—Trailer #1, Tag #1, or Push #1 Channel
12	Drive Axle Manifold Deflation Solenoid
13	Steer Axle Manifold Deflation Solenoid
14	PCU Solenoid Trailer #2, Tag #2, or Push #2
15	Brake Priority Pressure Switch
16	Pneumatic-Trailer #2, Tag #2, or Push #2 Channel
17	Wiring Harness
18	Tire Pressure Sensor - # 1
19	Tire Pressure Sensor - # 2
20	Tire Pressure Sensor - # 3
21	Tire Pressure Sensor - # 4
22	Tire Pressure Sensor - # 5
23	Tire Pressure Sensor - # 6
24	Tire Pressure Sensor - # 7
25	Tire Pressure Sensor - # 8
26	Tire Pressure Sensor - # 9
27	Tire Pressure Sensor - # 10
28	Tire Pressure Sensor - # 11
29	Tire Pressure Sensor - # 12

TABLE 7 - SUBSYSTEM IDENTIFICATION (SID) ASSIGNMENT LIST (CONTINUED)

30	Tire Pressure Sensor - # 13
31	Tire Pressure Sensor - # 14
32	Tire Pressure Sensor - # 15
33	Tire Pressure Sensor - # 16
34	Tire Temperature Sensor - # 1
35	Tire Temperature Sensor - # 2
36	Tire Temperature Sensor - # 3
37	Tire Temperature Sensor - # 4
38	Tire Temperature Sensor - # 5
39	Tire Temperature Sensor - # 6
40	Tire Temperature Sensor - # 7
41	Tire Temperature Sensor - # 8
42	Tire Temperature Sensor - # 9
43	Tire Temperature Sensor - # 10
44	Tire Temperature Sensor - # 11
45	Tire Temperature Sensor - # 12
46	Tire Temperature Sensor - # 13
47	Tire Temperature Sensor - # 14
48	Tire Temperature Sensor - # 15
49	Tire Temperature Sensor - # 16
50	Tire Sensor Voltage - # 1
51	Tire Sensor Voltage - # 2
52	Tire Sensor Voltage - # 3
53	Tire Sensor Voltage - # 4
54	Tire Sensor Voltage - # 5
55	Tire Sensor Voltage - # 6
56	Tire Sensor Voltage - # 7
57	Tire Sensor Voltage - # 8
58	Tire Sensor Voltage - # 9
59	Tire Sensor Voltage - # 10
60	Tire Sensor Voltage - # 11
61	Tire Sensor Voltage - # 12
62	Tire Sensor Voltage - # 13
63	Tire Sensor Voltage - # 14
64	Tire Sensor Voltage - # 15
65	Tire Sensor Voltage - # 16
66–150	Reserved for future assignment by SAE

Particulate Trap SIDs related to (MID = 177)

0	Reserved
1	Particulate Trap Intake Gas Temperature Bank 1
2	Particulate Trap Intake Gas Temperature Bank 2
3	Particulate Trap Outlet Gas Temperature Bank 1
4	Particulate Trap Outlet Gas Temperature Bank 2
5	Particulate Trap Intermediate Gas Temperature Bank 1
6	Particulate Trap Intermediate Gas Temperature Bank 2
7	Particulate Trap Differential Pressure Bank 1
8	Particulate Trap Differential Pressure Bank 2
9	Exhaust Gas Temperature 1

TABLE 7 - SUBSYSTEM IDENTIFICATION (SID) ASSIGNMENT LIST (CONTINUED)

10	Exhaust Gas Temperature 2
11	Exhaust Gas Temperature 3
12	Exhaust Gas Temperature 1 Bank 2
13	Exhaust Gas Temperature 2 Bank 2
14	Exhaust Gas Temperature 3 Bank 2
15	Aftertreatment #1 Fuel Pressure
16	Aftertreatment #1 Fuel Pressure Control Actuator
17	Aftertreatment #1 Fuel Enable Actuator
18	Aftertreatment #1 Ignition
19	Aftertreatment #2 Fuel Pressure
20	Aftertreatment #2 Fuel Pressure Control Actuator
21	Aftertreatment #2 Fuel Enable Actuator
22	Aftertreatment #2 Ignition
23	Aftertreatment #1 Air Enable Actuator
24	Aftertreatment #1 Purge Air Actuator
25	Aftertreatment #1 Atomization Air Actuator
26	Aftertreatment #1 Air System Relay
27	Aftertreatment #2 Air Enable Actuator
28	Aftertreatment #2 Purge Air Actuator
29	Aftertreatment #2 Atomization Air Actuator
30	Aftertreatment #2 Air System Relay
31	Aftertreatment #1 Supply Air Pressure
32	Aftertreatment #1 Purge Air Pressure
33	Aftertreatment #1 Air Pressure Control Actuator
34	Aftertreatment #1 Air Pressure Actuator Position
35	Aftertreatment #2 Supply Air Pressure
36	Aftertreatment #2 Purge Air Pressure
37	Aftertreatment #2 Air Pressure Control Actuator
38	Aftertreatment #2 Air Pressure Actuator Position
39	Aftertreatment #1 Failed to Ignite
40	Aftertreatment #1 Loss of Ignition
41	Aftertreatment #2 Failed to Ignite
42	Aftertreatment #2 Loss of Ignition
43	Aftertreatment #1 Regeneration Manually Disabled
44	Aftertreatment #2 Regeneration Manually Disabled
45	Aftertreatment #1 Particulate Trap Intake Pressure
46	Aftertreatment #1 Particulate Trap Outlet Pressure
47	Oil Scavenge Pump
48	Catalyst 1 System Monitor
49	Aftertreatment 1 Fuel Drain Actuator
50	Aftertreatment 1 Fuel Injector 1
51	Particulate Matter Trap Monitor
52	Aftertreatment #1 Purge Air Pressure
53	Aftertreatment #1 Secondary Air Mass Flow
54	Particulate Trap Active Regeneration Inhibited Due to Permanent System Lockout
55	Aftertreatment 1 Fuel Rate
56	Particulate Trap Active Regeneration Inhibited Status
57	Particulate Trap Active Regeneration Inhibited Due to Inhibit Switch

TABLE 7 - SUBSYSTEM IDENTIFICATION (SID) ASSIGNMENT LIST (CONTINUED)

58	Particulate Trap Active Regeneration Inhibited Due to Temporary System Lockout
59-150	Reserved for future assignment by SAE

Vehicle Sensors to Data Converter SIDs (MID = 178)

0	Reserved
1	Battery Positive Input
2	Battery Negative Input
3	Current Shunt (-) Input
4	Current Shunt (+) Input
5	Starter Negative Input
6	Alternator Negative Input
7	Transducer +5V Excitation
8	Starter Positive Input
9	Starter Solenoid Input
10	Alternator Positive Input
11	Alternator Field Input
12	Fuel Solenoid Positive Input
13	User Probe Input
14	Fuel Supply Sender Input
15	Air Cleaner Delta P Sender Input
16	Fuel Filter Delta P Sender Input
17	Oil Filter Inlet Sender Input
18	Fuel Return Sender Input
19	Oil Filter Outlet Sender Input
20	Fuel Vacuum Sender Input
21	Battery Negative Input Circuit
22	Battery Positive Input Circuit
23	Starter Positive Input Circuit
24	Starter Negative Input Circuit
25	Starter Solenoid Input Circuit
26	Alternator Field Input Circuit
27	Alternator Positive Input Circuit
28	Alternator Negative Input Circuit
29	Current Sensor Discharge Circuit
30	Current Sensor Charge Circuit
31-150	Reserved for future assignment by SAE

Refrigerant Management Systems SIDs (MID = 190)

0	Reserved
1	Refrigerant Charge
2	Refrigerant Moisture Level
3	Non-condensable Gas in Refrigerant
4	Refrigerant Flow Control Solenoid
5	Low Side Refrigerant Pressure Switch
6	Compressor Clutch Circuit
7	Evaporator Thermostat Circuit
8	Refrigerant Flow
9	Climate Control Air Filter Differential Pressure Sensor
10–150	Reserved for future assignment by SAE

TABLE 7 - SUBSYSTEM IDENTIFICATION (SID) ASSIGNMENT LIST (CONTINUED)

Tractor/Trailer Bridge SIDs (MID = 217, 218)	
0	Reserved
1	Auxiliary input #1
2	Auxiliary input #2
3	Auxiliary input #3
4	Auxiliary input #4
5	Auxiliary input #5
6	Auxiliary input #6
7	Auxiliary input #7
8	Auxiliary input #8
9	Clearance, side marker, identification lamp circuit (Black)
10	Left turn lamp circuit (Yellow)
11	Stop lamp circuit (Red)
12	Right turn lamp circuit (Green)
13	Tail lamp/license plate lamp circuit (Brown)
14	Auxiliary lamp circuit (Blue)
15	Tractor mounted rear axle slider control unit
16	Trailer mounted rear axle slider control unit
17–150	Reserved for future assignment by SAE
Collision Avoidance Systems SIDs (MID = 219)	
0	Reserved
1	Forward Antenna
2	Antenna Electronics
3	Brake Input Monitor
4	Speaker Monitor
5	Steering Sensor Monitor
6	Speedometer Monitor
7	Right Turn Signal Monitor
8	Left Turn Signal Monitor
9	Control Display Unit
10	Right Side Sensor
11	Left Side Sensor
12	Rear Sensor
13–150	Reserved for future assignment by SAE
Driveline Retarder SIDs (MID = 222)	
0	Reserved
1	Retarder Enable Solenoid Valve
2	Retarder Modulation Solenoid Valve
3	Retarder Response Solenoid Valve
4	Retarder Modulation Request Sensor
5	Retarder Response System Pressure Indicator
6–150	Reserved for future assignment by SAE

TABLE 7 - SUBSYSTEM IDENTIFICATION (SID) ASSIGNMENT LIST (CONTINUED)

Safety Restraint System SIDs (MID = 232, 254)	
0	Reserved
1	Driver Air Bag Ignitor Loop
2	Passenger Air Bag Ignitor Loop
3	Left Belt Tensioner Ignitor Loop
4	Right Belt Tensioner Ignitor Loop
5	Safety Restraint System (SRS) Lamp—directly controlled by the ECU
6	Automotive Seat Occupancy Sensor (AOS)—Passenger Side
7	Side Collision Detector (SDC)—Left
8	Side Bag Ignitor Loop 1—Left
9	Side Bag Ignitor Loop 2—Left
10	Side Collision Detector—Right
11	Side Bag Ignitor Loop 1—Right
12	Side Bag Ignitor Loop 2—Right
13	Rollover Sensor
14	Driver Air Bag Stage 2 Igniter Loop
15	Passenger Air Bag Stage 2 Igniter Loop
16–150	Reserved for future assignment by SAE
Forward Road Image Processor SIDs (MID = 248)	
0	Reserved
1	Forward View Imager System
2-150	Reserved for future assignment by SAE
Brake Stroke Alert Monitor, Tractor SIDs (MID = 253)	
0	Reserved
1	Tractor Brake Stroke Axle 1 Left
2	Tractor Brake Stroke, Axle 1 Right
3	Tractor Brake Stroke, Axle 2 Left
4	Tractor Brake Stroke, Axle 2 Right
5	Tractor Brake Stroke, Axle 3 Left
6	Tractor Brake Stroke, Axle 3 Right
7	Tractor Brake Stroke, Axle 4 Left
8	Tractor Brake Stroke, Axle 4 Right
9	Tractor Brake Stroke Alert Monitor
10	Trailer #1 Brake Stroke, Axle 1 Left
11	Trailer #1 Brake Stroke, Axle 1 Right
12	Trailer #1 Brake Stroke, Axle 2 Left
13	Trailer #1 Brake Stroke, Axle 2 Right
14	Trailer #1 Brake Stroke, Axle 3 Left
15	Trailer #1 Brake Stroke, Axle 3 Right
16	Trailer #1 Brake Stroke, Axle 4 Left
17	Trailer #1 Brake Stroke, Axle 4 Right
18	Trailer #1 Brake Stroke, Alert Monitor
19	Trailer #2 Brake Stroke, Axle 1 Left
20	Trailer #2 Brake Stroke, Axle 1 Right
21	Trailer #2 Brake Stroke, Axle 2 Left
22	Trailer #2 Brake Stroke, Axle 2 Right
23	Trailer #2 Brake Stroke, Axle 3 Left

TABLE 7 - SUBSYSTEM IDENTIFICATION (SID) ASSIGNMENT LIST (CONTINUED)

24	Trailer #2 Brake Stroke, Axle 3 Right
25	Trailer #2 Brake Stroke, Axle 4 Left
26	Trailer #2 Brake Stroke Axle 4 Right
27	Trailer #2 Brake Stroke Alert Monitor
28	Trailer #3 Brake Stroke, Axle 1 Left
29	Trailer #3 Brake Stroke, Axle 1 Right
30	Trailer #3 Brake Stroke, Axle 2 Left
31	Trailer #3 Brake Stroke, Axle 2 Right
32	Trailer #3 Brake Stroke, Axle 3 Left
33	Trailer #3 Brake Stroke, Axle 3 Right
34	Trailer #3 Brake Stroke, Axle 4 Left
35	Trailer #3 Brake Stroke Axle 4 Right
36	Trailer #3 Brake Stroke Alert Monitor
37	Trailer Brake Stroke, Axle 1 Left
38	Trailer Brake Stroke, Axle 1 Right
39	Trailer Brake Stroke, Axle 2 Left
40	Trailer Brake Stroke, Axle 2 Right
41	Trailer Brake Stroke, Axle 3 Left
42	Trailer Brake Stroke, Axle 3 Right
43	Trailer Brake Stroke, Axle 4 Left
44	Trailer Brake Stroke, Axle 4 Right
45	Trailer Brake Stroke Alert Monitor
46-150	Reserved for future assignment by SAE

1. Superseded by SIDs 151–155

4. NOTES

4.1 Marginal Indicia

The change bar (l) located in the left margin is for the convenience of the user in locating areas where technical revisions have been made to the previous issue of the report. An (R) symbol to the left of the document title indicates a complete revision of the report.

PREPARED BY THE SAE TRUCK AND BUS LOW SPEED COMMUNICATIONS SUBCOMMITTEE
OF THE SAE TRUCK AND BUS ELECTRICAL/ELECTRONIC COMMITTEE

APPENDIX A - PARAMETER DEFINITIONS

A.0 REQUEST PARAMETER

Used to request parameter data transmission from other components on the data link.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: As needed
Message Priority: 8
Format:

PID	Data
0	a

a— Parameter ID of the Requested parameter

Any and all components measuring or calculating the specified parameter should transmit it if possible.

A.1 RESERVED

To be assigned. This PID was reclaimed as of August 2007.

A.2 RESERVED

To be assigned. This PID was reclaimed as of August 2007.

A.3 RESERVED

To be assigned. This PID was reclaimed as of August 2007.

A.4 DYNAMIC MID CLAIM FOR SAE J2497 GATEWAY DEVICES

Used to claim a MID for use on SAE J2497 networks. Devices using this message will become potential gateway devices on the SAE J2497 bus, and the MID claimed here will identify which trailer subnet sent or is intended to receive messages being transferred using the SAE J2497 network.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: As needed (see below for special random period requirements)
Message Priority: 8
Format:

PID	Data
4	a

a— Status code. Set to 255 (all binary ones.)

This message is used to claim a MID to be used to identify a trailer on a vehicle. There may be multiple trailers on the same vehicle, so a method of assigning unique MIDs for broadcasting on the SAE J2497 Data Link is needed.

J2497 Dynamic MID Claim Process Description

Each SAE J2497 device will, on power up, calculate a "random" transmit delay period (perhaps using internal clock or other unique data) between 500 and 1000 milliseconds long. Once initialization is complete, the device will listen to messages on the SAE J2497 Data Link for that period and record the MID of each device that transmits PID4 messages on the SAE J2497 bus. At the completion of the initial delay period, the device will choose an unused MID from the set 88 - 110 and transmit a message onto the SAE J2497 Data Link containing only PID 4 and its data byte. It will then have "claimed" that MID on the SAE J2497 Data Link unless or until another device transmits a message using that MID. In that case, the device will choose another MID from that same set and begin the claim process again.

The first MID claimed by any individual device should be the MID that it last used successfully, which will allow a complete vehicle to continue to operate with the same set of MIDs up until the next time another or a different trailer is added to it. Note that the process will normally allow the first claimant to use its preferred MID, however, when a trailer is added to a vehicle, then the new trailer will always get its first MID choice and the trailer already attached to the vehicle that was using the MID claimed by the new trailer must claim a new MID. There is no claim priority given to how long a particular device has been connected to the vehicle other than that the newly added device should not attempt to use a MID that is in use during its listening phase. Thus the newest device should always claim successfully the first time. A device whose MID is claimed by a recently added device should begin the claim process again, avoiding all MIDs that it has heard since power up.

A.5 RESERVED

To be assigned. This PID was reclaimed as of August 2007.

A.6 RESERVED

To be assigned. This PID was reclaimed as of August 2007.

A.7 AXLE #2 LIFT AIR PRESSURE

Gauge Pressure of air in system that utilizes compressed air to provide force between a lift axle and frame for purposes of lifting or lowering the axle.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 4.14 kPa (0.6 lbf/in²)
Maximum Range: 0.0 to 1055 kPa (0.0 to 153.0 lbf/in²)
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
7	a
a—	Axle #2 lift air pressure

A.8 BRAKE SYSTEM AIR PRESSURE LOW WARNING SWITCH STATUS

Identifies the current status of the low pressure warning switch that monitors the air brake system.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Bit Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: 500 msec
Message Priority: 4
Format:

PID	Data
8	a
a—	Brake system low air pressure warning switch status Bits 8-7: Emergency reservoir - trailer Bits 6-5: Service reservoir - trailer Bits 4-3: Secondary reservoir - powered vehicle Bits 2-1: Primary reservoir - powered vehicle

NOTE: Each status will be described using the following nomenclature:

00	Off/Normal
01	On/Warning
10	Error condition
11	Not available

A.9 AXLE LIFT STATUS

Identifies the current status or position of a lift axle.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Bit Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: On change or on request
Message Priority: 8
Format:

PID	Data
9	a
a—	Axle lift lock status Bits 8-5: Reserved-all bits set to 1 Bits 4-3: Axle lift position Bits 2-1: Axle lift switch status

NOTE: Each status will be described using the following nomenclature:

00	Off/Down
01	On/Up
10	Error condition
11	Not available

NOTE: See PID 346 for additional lift axle parameters.

A.10 AXLE SLIDER STATUS

Identifies the current status of a sliding axle suspension.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Bit Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: On change or on request
Message Priority: 8
Format:

PID	Data
10	a
a—	Slider lock status Bits 8-5: Reserved-all bits set to 1 Bits 4-3: Axle slider lock status Bits 2-1: Axle slider lock switch status

NOTE: Each status will be described using the following nomenclature:

00	Off/Unlocked
01	On/Locked
10	Error condition
11	Not available

A.11 CARGO SECUREMENT

Used to monitor hold down device to include chain, cable or other device that may be used to secure a load.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Bit Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: 10.0 s
Message Priority: 7
Format:

PID	Data
11	a
a—	Cargo securement information Bit 8-5: Cargo sector number 1 to 16 Bit 4-3: Reserved-all bits set to 1 Bit 2-1: Status of the cargo securement sensors 00 = Cargo secure 01 = Loose cargo 10 = Error condition 11 = Not available

A.12 BRAKE STROKE STATUS

Identifies the current state of the vehicle foundation brakes.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Bit Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: 10.0 s
Message Priority: 6
Format:

PID	Data
12	a
a—	Brake stroke status
	Bit 8-5: Axle number 1 to 16 (represented as 0 to 15)
	Bit 4-2: Brake status/Stroke adjustment
	000 = OK
	001 = Out of adjustment
	010 = Delay brake return
	011 = Brake pads worn
	100 = Delayed brake application
	101 = Reserved
	110 = Error
	111 = Not available
	Bit 1: 1 = Left wheel, 0 = Right wheel

Axle number is incremented from front to back of the vehicle with the front most axle being number 1. For example, a value of 0 in bits 8-5 identifies axle number 1 and a value of 15 in bits 8-5 identifies axle number 16.

A.13 ENTRY ASSIST POSITION/DEPLOYMENT

Position of the steps, chair lift, etc. 0% is used to represent fully deployed, 102% is used to represent in full travel position.

Parameter Data Length: 1 Character
Data Type: Unsigned Short integer
Bit Resolution: 0.4 %
Maximum Range: 0.0 to 102.0 %
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
13	a
a—	Entry Assist Position/Deployment

A.14 ENTRY ASSIST MOTOR CURRENT

Current measured of the entry assist motor.

Parameter Data Length: 1 Character
Data Type: Unsigned Short integer
Bit Resolution: 0.04 A
Maximum Range: 0.0 to 10.2 A
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
14	a
a—	Entry Assist Motor Current

A.15 FUEL SUPPLY PUMP INLET PRESSURE

Absolute pressure of fuel at fuel supply pump inlet.

Parameter Data Length: 1 Character
Data Type: Unsigned Short integer
Bit Resolution: 1.724 kPa (0.25 lbf/in^2)
Maximum Range: 0.0 to 439.5 kPa (0.0 to 63.75 lbf/in^2)
Transmission Update Period: 10.0 s
Message Priority: 7
Format:

PID	Data
15	a
a—	Fuel supply pump inlet pressure

A.16 SUCTION SIDE FUEL FILTER DIFFERENTIAL PRESSURE

Differential pressure measured across the fuel filter between the fuel tank and the supply pump.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 1.724 kPa (0.25 lbf/in^2)
Maximum Range: 0.0 to 439.5 kPa (0.0 to 63.75 lbf/in^2)
Transmission Update Period: 10.0 s
Message Priority: 7
Format:

PID	Data
16	a
a—	Suction side fuel filter differential pressure

NOTE: See also PID 95.

A.17 ENGINE OIL LEVEL REMOTE RESERVOIR

Ratio of current volume of engine oil in remote reservoir to maximum recommended volume.

If a single switch (on/off) is used, 20% and 100% respectively will be used where the 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 level 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.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.5%
Maximum Range: 0.0 to 127.5%
Transmission Update Period: 10.0 s
Message Priority: 7
Format:

PID	Data
17	a
a—	Engine oil level remote reservoir

NOTE: For a two switch system, the first switch (add level) is identified by this PID. The second switch (critically low level) is identified by engine SID number 311 (Associated with Engine MIDs 128, 175, 183, 184, 185, 186).

A.18 EXTENDED RANGE FUEL PRESSURE

Gauge pressure of fuel in system as delivered from the supply pump to the injection pump.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 4 kPa (0.58 lbf/in^2)
Maximum Range: 0.0 to 1020 kPa (0.0 to 148 lbf/in^2)
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
18	a
a—	Extended range fuel pressure

NOTE: See PID 94 for alternate range and bit resolution.

A.19 EXTENDED RANGE ENGINE OIL PRESSURE

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

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 4 kPa (0.58 lbf/in^2)
Maximum Range: 0.0 to 1020 kPa (0.0 to 148 lbf/in^2)
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
19	a
a—	Extended range engine oil pressure

NOTE: See PID 100 for alternate range and bit resolution.

A.20 EXTENDED RANGE ENGINE COOLANT PRESSURE

Gauge pressure of liquid found in the engine cooling system.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 2 kPa (0.29 lbf/in^2)
Maximum Range: 0.0 to 510 kPa (0.0 to 74 lbf/in^2)
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
20	a
a—	Extended range engine coolant pressure

NOTE: See PID 109 for alternate range and bit resolution.

A.21 ENGINE ECU TEMPERATURE

Internal air temperature of the engine ECU.

Parameter Data Length: 1 Character
Data Type: Signed Short Integer
Bit Resolution: 2.5 °F
Maximum Range: –320.0 to 317.5 °F
Transmission Update Period: 1.0 s
Message Priority: 8
Format:

PID	Data
21	a
a—	Engine ECU temperature

A.22 EXTENDED CRANKCASE BLOW-BY PRESSURE

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

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.029275 kPa (0.004245 lbf/in^2)
Maximum Range: 0.0 to 7.4651 kPa (0.0 to 1.0824 lbf/in^2)
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
22	a
a—	Extended crankcase blow-by pressure

NOTE: See PID 30 for alternate range and bit resolution.

A.23 GENERATOR OIL PRESSURE

Gauge pressure of oil in an auxiliary generator engine lubrication system.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 3.45 kPa (0.5 lbf/in^2)
Maximum Range: 0.0 to 879.0 kPa (0.0 to 127.5 lbf/in^2)
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
23	a
a—	Generator oil pressure

NOTE: See PID 100 for primary engine oil pressure.

A.24 GENERATOR COOLANT TEMPERATURE

The temperature of liquid found in an auxiliary generator engine cooling system.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 1.0 °F
Maximum Range: 0.0 to 255.0 °F
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
24	a
a—	Generator coolant temperature

NOTE: See PID 110 for primary engine coolant temperature.

A.25 AIR CONDITIONER SYSTEM STATUS #2

Identifies the current state of the air conditioner (A/C) compressor pressures and the evaporator temperatures.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Resolution: Binary
Maximum Range: 0 to 225
Transmission Update Period: 10.0 s or on change
Message Priority: 8
Format:

PID	Data
25	a
a—	Air conditioner system status #2
	Bits 8-7: Compressor discharge side 00 = Not at high pressure 01 = Is at high pressure 10 = Error 11 = Not available/not applicable
	Bits 6-5: Compressor discharge side 00 = Not at very high pressure 01 = Is at very high pressure 10 = Error 11 = Not available/not applicable
	Bits 4-3: Compressor suction side 00 = Not at low pressure 01 = Is at low pressure 10 = Error 11 = Not available/not applicable
	Bits 2-1: Evaporator temperature 00 = Evaporator thermostat signal is above the low temperature set point 01 = Evaporator thermostat signal is below the low temperature set point 10 = Error 11 = Not available/not applicable

NOTE: See PID 50 for additional A/C system parameters.

A.26 ESTIMATED 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.

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.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.4%
Maximum Range: 0.0 to 102.0%
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
26	a
a—	Estimated percent fan speed

A.27 PERCENT EXHAUST GAS RECIRCULATION VALVE #1 POSITION

Ratio of current exhaust gas recirculation (EGR) valve position to the maximum EGR valve position. A value of 0% means no EGR.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.5%
Maximum Range: 0.0 to 127.5%
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
27	a
a—	Percent exhaust gas recirculation valve position

A.28 PERCENT ACCELERATOR POSITION #3

Ratio of actual accelerator position to maximum accelerator position.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.4%
Maximum Range: 0.0 to 102.0%
Transmission Update Period: 0.1 s
Message Priority: 3
Format:

PID	Data
28	a
a—	Percent accelerator position #3

NOTE: See PIDs 29 and 91 for additional accelerator position parameters. If only one accelerator position exists on a vehicle, PID 91 should be used.

A.29 PERCENT ACCELERATOR POSITION #2

Ratio of actual accelerator position to maximum accelerator position.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.4%
Maximum Range: 0.0 to 102.0%
Transmission Update Period: 0.1 s
Message Priority: 3
Format:

PID	Data
29	a
a—	Percent accelerator position #2

NOTE: See PIDs 28 and 91 for additional accelerator position parameters. If only one accelerator position exists on a vehicle, PID 91 should be used.

A.30 CRANKCASE BLOW-BY PRESSURE

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

Parameter Data Length: 1 Character
Data Type: Signed Short Integer
Bit Resolution: 0.862 kPa (0.125 lbf/in^2)
Maximum Range: –110.0 to +109.5 kPa (–16.00 to +15.875 lbf/in^2)
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
30	a
a—	Crankcase blow-by pressure

NOTE: See PID 22 for alternate range and bit resolution.

A.31 TRANSMISSION RANGE POSITION

The current position of the range cylinder. 0% = range cylinder fully toward the low range position; 100% = range cylinder fully toward the high range position.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.4%
Maximum Range: 0.0 to 102.0%
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
31	a
a—	Transmission Range Position

A.32 TRANSMISSION SPLITTER POSITION

The current position of the splitter cylinder. 0% = splitter cylinder fully toward the low split position; 100% = splitter cylinder fully toward the high split position.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.4%
Maximum Range: 0.0 to 102.0%
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
32	a
a—	Transmission Splitter Position

A.33 CLUTCH CYLINDER POSITION

The current position of the clutch engagement cylinder. 0% = cylinder fully retracted (i.e., clutch fully engaged); 100% = cylinder fully extended (i.e., clutch fully disengaged.)

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.4%
Maximum Range: 0.0 to 102.0%
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
33	a
a—	Clutch Cylinder Position

A.34 CLUTCH CYLINDER ACTUATOR STATUS

Identifies the current status of the actuators used to control the functions of the clutch cylinder.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
34	a
a—	Clutch Cylinder Actuator Status Bits 8-7: Coarse engagement actuator status Bits 6-5: Fine engagement actuator status Bits 4-3: Coarse disengagement actuator status Bits 2-1: Fine disengagement actuator status

NOTE: Each status will be described using the following nomenclature:

00	Off
01	On
10	Error Condition
11	Not available

A.35 SHIFT FINGER ACTUATOR STATUS #2

Identifies the current status of the actuators that move the shift finger.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
35	a
a—	Shift Finger Actuator Status Bits 8-5: Not defined Bits 4-3: Gear actuator #3 status Bits 2-1: Rail actuator #3 status

NOTE: Each status will be described using the following nomenclature:

00	Off
01	On
10	Error condition
11	Not available

NOTE: See PID 58 for additional gear actuator status.

A.36 CLUTCH PLATES WEAR CONDITION

The current wear condition of the clutch plates. 0% = clutch plates with no wear; 100% = clutch plates are completely worn out.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.4%
Maximum Range: 0.0 to 102.0%
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
36	a
a—	Clutch Plates Wear Condition

A.37 TRANSMISSION TANK AIR PRESSURE

The pressure of the air in the tank supplying the automatically shifting transmission.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 6.89 kPa (1.0 lbf/in^2)
Maximum Range: 0.0 to 1757.0 kPa (0.0 to 255.0 lbf/in^2)
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
37	a
a—	Transmission Tank Air Pressure

A.38 SECOND FUEL LEVEL (RIGHT SIDE)

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

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Resolution: 0.5%
Maximum Range: 0.0 to 127.5%
Transmission Update Period: 10.0 s
Message Priority: 6
Format:

PID	Data
38	a
a—	Second Fuel Level (Right Side)

NOTE: See PID 96 for the primary fuel level.

A.39 TIRE PRESSURE CHECK INTERVAL

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

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 1 min
Maximum Range: 0 to 255 min
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
39	a
a—	Tire pressure check interval

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

A.40 ENGINE RETARDER SWITCHES STATUS

Identifies the current state of the switch contacts used in the engine retarder system.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Bit Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: 0.2 s, or on state change
Message Priority: 3
Format:

PID	Data
40	a

a— Engine retarder switches status

Bits 8-7: Reserved—all bits set to 1

Bits 6-3: Engine retarder level switch

0 = 0 cylinders
1 = 1 cylinders
2 = 2 cylinders
3 = 3 cylinders
4 = 4 cylinders
5 = 5 cylinders
6 = 6 cylinders
7 = 7 cylinders
8 = 8 cylinders
9-13 = reserved—to be assigned
14 = error
15 = not available

Bits 2-1: Engine retarder switch

00 = off
01 = on
10 = error
11 = not available

A.41 CRUISE CONTROL SWITCHES STATUS

Identifies the current state of the switch contacts used in the cruise control system.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Bit Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: 1.0 s, or on state change
Message Priority: 3
Format:

PID	Data
41	a
a—	Cruise control switches status
	Bits 8-7: Reserved—all bits set to 1
	Bits 6-5: Cruise control on/off switch status
	Bits 4-3: Cruise control set switch status
	Bits 2-1: Cruise control resume switch status

NOTE: Each status will be described using the following nomenclature:

00	Off
01	On
10	Error condition
11	Not available

A.42 PRESSURE SWITCH STATUS

Identifies the current state of an open/closed type switch used to determine if adequate pressure exists for system implementation.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Bit Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
42	a
a—	Pressure switch status
	Bits 8-3: Reserved—all bits set to 1
	Bits 2-1: Tire pressure supply switch status

NOTE: Each status will be described using the following nomenclature:

00	Below set pressure
01	At or above set pressure
10	Error condition
11	Not available

A.43 IGNITION SWITCH STATUS

Identifies the current state of the contacts within the ignition switch. These contacts are not necessarily mutually exclusive.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Bit Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: 1.0 s, or on state change
Message Priority: 5
Format:

PID	Data
43	a
a—	Ignition switch status Bits 8-7: Start aid contacts status Bits 6-5: Crank contacts status Bits 4-3: Run contacts status Bits 2-1: Accessory contacts status

NOTE: Each status will be described using the following nomenclature:

00	Off
01	On
10	Error condition
11	Not available

A.44 ATTENTION/WARNING INDICATOR LAMPS STATUS

Identifies the current state of the lamps used as driver attention or warning indicators.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Bit Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: 1.0 s, or on state change
Message Priority: 5
Format:

PID	Data
44	a
a—	Attention/warning indicator lamps status Bits 8-7: Reserved—both bits set to 1 Bits 6-5: Protect lamp status Bits 4-3: Amber lamp status Bits 2-1: Red lamp status

NOTE 1: Each status will be described using the following nomenclature:

00	Off
01	On
10	Error condition
11	Not available

NOTE 2: The red lamp is used to indicate a mission-critical or mission-disabling situation.

NOTE 3: The amber lamp is used to indicate a non-mission-critical or non-mission-disabling situation.

NOTE 4: The protect lamp is used to report a problem that is most probably not electronic subsystem related. This could indicate reduced performance or potentially a mission-critical or mission-disabling situation. For instance, engine coolant temperature is exceeding its prescribed temperature range.

A.45 INLET AIR HEATER STATUS

Identifies the current state of the inlet air heaters. The “wait to start lamp” signal indicates that the engine is too cold to start and the operator should wait until the signal becomes inactive (turns off).

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Bit Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: 1.0 s when active, or on state change
Message Priority: 5
Format:

PID	Data
45	a
a—	Inlet air heater status Bits 8-7: Reserved—all bits set to 1 Bits 6-5: Wait to Start Lamp Bits 4-3: Heater 2 status Bits 2-1: Heater 1 status

NOTE: Each status will be described using the following nomenclature:

00	Off
01	On
10	Error Condition
11	Not available

A.46 VEHICLE WET TANK PRESSURE

Identifies the current gage pressure inside the vehicle wet tank.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 6.89 kPa (1.0 lbf/in^2)
Maximum Range: 0.0 to 1757.0 kPa (0.0 to 255.0 lbf/in^2)
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
46	a
a—	Vehicle wet tank pressure

A.47 RETARDER STATUS

Identifies the current state of vehicle retarders.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Bit Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: 1.0 s when active, or on state change
Message Priority: 5
Format:

PID	Data
47	a
a—	Retarder status Bits 8-3: Reserved - all bits set to 1 Bits 2-1: Transmission output retarder status

NOTE 1: Each status will be described using the following nomenclature:

00	Off
01	On
10	Error condition
11	Not available

NOTE 2: See PID 121 for engine retarder status.

A.48 EXTENDED RANGE BAROMETRIC PRESSURE

Absolute air pressure of the atmosphere.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.6 kPa (0.087 lbf/in^2)
Maximum Range: 0.0 to 153.0 kPa (0.0 to 22.2 lbf/in^2)
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
48	a
a—	Extended range barometric pressure

NOTE: See PID 108 for alternate bit resolution.

A.49 ABS CONTROL STATUS

Identifies the current state of the ABS control functions, lamp and switch.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Bit Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: 0.5 s
Message Priority: 3
Format:

PID	Data
49	a
a—	ABS control status
	Bits 8-7: ABS off-road function switch
	Bits 6-5: ABS retarder control
	Bits 4-3: ABS brake control
	Bits 2-1: ABS warning lamp

NOTE: Each status will be described using the following nomenclature:

00	Off/Not active
01	On/Active
10	Error condition
11	Not available

A.50 AIR CONDITIONER SYSTEM STATUS/COMMAND #1

Used to request the air conditioner (A/C) compressor clutch unit to temporarily disable the clutch. This parameter also provides the current state of the engine fan, A/C system, and compressor clutch.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: 5.0 s (during disengagement) or on change
Message Priority: 8
Format:

PID	Data
50	a

a— Air conditioner compressor clutch status/command
- Bits 8-7: Engine fan request
  - 00=No request
  - 01=Fan is requested
  - 10=Error
  - 11=Not available/not applicable
- Bits 6-5: Air Conditioning Request Input
  - 00=No request
  - 01=A/C is requested
  - 10=Error
  - 11=Not available/not applicable.
- Bits 4-3: Request temporary clutch disengagement sense
  - 00=No request
  - 01=Clutch disengagement requested
  - 10=Error
  - 11=Not available/not applicable.
- Bits 2-1: Clutch engagement status
  - 00=Off (disengaged)
  - 01=On (engaged)
  - 10=Error
  - 11=Not available/not applicable

NOTE: The reception of a clutch disengagement request by the clutch unit will restart the clutch disengagement timer. The clutch engagement status bits (Bits 2-1) are ignored if the clutch disengagement bits (Bits 4-3) are requesting clutch disengagement. See PID 25 for additional A/C system parameters.

A.51 THROTTLE 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.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.4%
Maximum Range: 0.0 to 102.0%
Transmission Update Period: 0.2 s
Message Priority: 3
Format:

PID	Data
51	a

a— Throttle position

A.52 ENGINE INTERCOOLER TEMPERATURE

The temperature of liquid found in the engine intercooler, located after the turbocharger.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 1.0 °F
Maximum Range: 0.0 to 255.0 °F
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
52	a
a—	Engine intercooler temperature

A.53 TRANSMISSION SYNCHRONIZER CLUTCH VALUE

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

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.4%
Maximum Range: 0.0 to 102.0%
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
53	a
a—	Transmission synchronizer clutch value

A.54 TRANSMISSION SYNCHRONIZER BRAKE VALUE

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

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.4%
Maximum Range: 0.0 to 102.0%
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
54	a
a—	Transmission synchronizer brake value

A.55 SHIFT FINGER POSITIONAL STATUS

Identifies the current status of the switches that represent the position of the shift finger.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
55	a
a—	Shift finger positional status Bits 8-7: Reserved—both bits set to 1 Bits 6-5: Center rail sense BIts 4-3: Fore/aft sense Bits 2-1: Neutral sense

NOTE: Each status will be described using the following nomenclature:

00	Off
01	On
10	Error condition
11	Not available

A.56 TRANSMISSION RANGE SWITCH STATUS

Identifies the current status of the switches that represent range position.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
56	a
a—	Transmission range switch status Bits 8-5: Reserved—all bits set to 1 Bits 4-3: Low range sense Bits 2-1: High range sense

NOTE: Each status will be described using the following nomenclature:

00	Off
01	On
10	Error condition
11	Not available

A.57 TRANSMISSION ACTUATOR STATUS #2

Identifies the current status of the actuators that control the clutch, the engine defuel mechanism, and the inertia brake.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
57	a
a—	Transmission actuator status #2
	Bits 8-7: Inertia brake actuator status
	Bits 6-5: Defuel actuator status
	Bits 4-3: Lockup clutch actuator status
	Bits 2-1: Clutch actuator status

NOTE: Each status will be described using the following nomenclature:

00	Off
01	On
10	Error condition
11	Not available

A.58 SHIFT FINGER ACTUATOR STATUS

Identifies the current status of the actuators that move the shift finger.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
58	a
a—	Shift finger actuator status
	Bits 8-7: Gear actuator #2 status
	Bits 6-5: Rail actuator #2 status
	Bits 4-3: Gear actuator #1 status
	Bits 2-1: Rail actuator #1 status

NOTE: Each status will be described using the following nomenclature:

00	Off
01	On
10	Error condition
11	Not available

NOTE: See PID 35 for additional gear actuator status.

A.59 SHIFT FINGER GEAR POSITION

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

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.4%
Maximum Range: 0.0 to 102.0%
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
59	a
a—	Shift finger gear position

A.60 SHIFT FINGER RAIL POSITION

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

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.4%
Maximum Range: 0.0 to 102.0%
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
60	a
a—	Shift finger rail position

A.61 PARKING BRAKE ACTUATOR STATUS

Identifies the current status of the actuators that control the parking brakes.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
61	a
a—	Parking brake actuator status Bits 8-5: Reserved—all bits set to 1 Bits 4-3: Parking brake off actuator status Bits 2-1: Parking brake on actuator status

NOTE: Each status will be described using the following nomenclature:

00	Off
01	On
10	Error condition
11	Not available

A.62 RETARDER INHIBIT STATUS

Identifies the current state of the device that inhibits use of the engine retarder.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
62	a
a—	Retarder inhibit status Bits 8-3: Reserved—all bits set to 1 Bits 2-1: Retarder inhibit status

NOTE: Each status will be described using the following nomenclature:

00	Off (Retarder inhibit not active)
01	On (Retarder inhibit is active)
10	Error condition
11	Not available

A.63 TRANSMISSION ACTUATOR STATUS #1

Identifies the current status of the actuators used to control the functions of the auxiliary unit.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
63	a
a—	Transmission actual status #1 Bits 8-7: Splitter indirect actuator status Bits 6-5: Splitter direct actuator status Bits 4-3: Range low actuator status Bits 2-1: Range high actuator status

NOTE: Each status will be described using the following nomenclature:

00	Off
01	On
10	Error condition
11	Not available

A.64 DIRECTION SWITCH STATUS

Identifies the current state of the switches that indicate the direction of the transmission.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
64	a
a—	Direction switch status Bits 8-7: Reserved—both bits set to 1 Bits 6-5: Forward switch status Bits 4-3: Neutral switch status Bits 2-1: Reverse switch status

NOTE: Each status will be described using the following nomenclature:

00	Off
01	On
10	Error condition
11	Not available

A.65 BRAKE SWITCH STATUS

Identifies the current state of the brake switches.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
65	a
a—	Brake switch status Bits 8-5: Reserved—all bits set to 1 Bits 4-3: Brake system switch status Bits 2-1: Service brake switch status

NOTE: Each status will be described using the following nomenclature:

00	Off (Brake pedal released)
01	On (Brake pedal pressed)
10	Error condition
11	Not available

A.66 VEHICLE ENABLING COMPONENT STATUS

Identifies the current state of the components that enable the vehicle to start and operate properly.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
66	a

a— Vehicle enabling component status

Bits 8-7: Engine Compartment Door (Hood) Switch Status
- 00= Hood open
- 01= Hood closed
- 10= Error
- 11= Not available/not applicable

Bits 6-5: Power connect device status
- 00=Off
- 01=On
- 10=Error
- 11=Not available/not applicable

Bits 4-3: Start enable device status
- 00=Off (Can’t start)
- 01=On (Can Start)
- 10=Error
- 11=Not available/not applicable

Bits 2-1: Ignition switch status
- 00=Off
- 01=On
- 10=Error
- 11=Not available/not applicable

A.67 SHIFT REQUEST SWITCH STATUS

Identifies the current state of the switches used to request an upshift or downshift.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
67	a
a—	Vehicle enabling component status Bits 8-5: Reserved—all bits set to 1 Bits 4-3: Downshift switch status Bits 2-1: Upshift switch status

NOTE: Each status will be described using the following nomenclature:

00	Off
01	On
10	Error condition
11	Not available

A.68 TORQUE LIMITING FACTOR

Ratio of current output torque allowed (due to adverse operating conditions) to the maximum torque available at the current engine speed (under normal operating conditions).

$$\text{Torque Limiting Factor} = 100 \times \frac{\text{Allowed Max. Torque at current engine speed}}{\text{Max. Torque Available at current engine speed}} \quad \text{(Eq. A1)}$$

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.5%
Maximum Range: 0.0 to 127.5%
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
68	a
a—	Torque Limiting Factor

A.69 TWO SPEED AXLE SWITCH STATUS

Identifies the commanded range for a two speed axle.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: 1.0 s
Message Priority: 6
Format:

PID	Data
69	a
a—	Two speed axle switch status
	Bit 8: 0=high range is commanded
	1=low range is commanded
	Bits 7-1: Undefined

A.70 PARKING BRAKE SWITCH STATUS

Identifies the state (active/inactive) of the parking brake switch.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
70	a
a—	Parking brake switch status
	Bit 8: 1=active/0=inactive
	Bits 7-1: Undefined

A.71 IDLE SHUTDOWN TIMER STATUS

State of the idle shutdown timer system (active, not active) for the various modes of operation.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data	
71	a	
a—	Idle shutdown timer status	
	Bit 8: Idle shutdown timer status	1=active/0=inactive
	Bits 7-5: Undefined	
	Bit 4: Idle shutdown timer function	1=enabled in calibration
		0=disabled in calibration
	Bit 3: Idle shutdown timer override	1=active/0=inactive
	Bit 2: Engine has shutdown by idle timer	1=yes/0=no
	Bit 1: Driver alert mode	1=active/0=inactive

A.72 BLOWER BYPASS VALVE POSITION

Relative position of the blower bypass valve.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.4%
Maximum Range: 0.0 to 102.0%
Transmission Update Period: 0.5 s
Message Priority: 3
Format:

PID	Data
72	a
a—	Blower bypass valve position

A.73 AUXILIARY WATER PUMP PRESSURE

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

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 13.8 kPa (2 lbf/in^2)
Maximum Range: 0.0 to 3516 kPa (0.0 to 510 lbf/in^2)
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

D	Data
73	a
a—	Auxiliary water pump pressure

A.74 MAXIMUM ROAD SPEED LIMIT

Maximum vehicle velocity allowed.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.5 mph (0.805 km/h)
Maximum Range: 0.0 to 205.2 km/h (0.0 to 127.5 mph)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
74	a
a—	Maximum road speed limit

A.75 STEERING AXLE TEMPERATURE

Temperature of lubricant in steering axle.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 1.2 °F
Maximum Range: 0.0 to 306.0 °F
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
75	a
a—	Steering axle temperature

A.76 AXLE #1 LIFT AIR PRESSURE

Gage pressure of air in system that utilizes compressed air to provide force between a lift axle and frame for purposes of lifting or lowering the axle.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 4.14 kPa (0.6 lbf/in^2)
Maximum Range: 0.0 to 1055 kPa (0.0 to 153.0 lbf/in^2)
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
76	a
a—	Axle #1 lift air pressure

A.77 FORWARD REAR DRIVE AXLE TEMPERATURE

Temperature of axle lubricant in forward rear drive axle.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 1.2 °F
Maximum Range: 0.0 to 306.0 °F
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
77	a
a—	Forward rear drive axle temperature

A.78 REAR REAR DRIVE AXLE TEMPERATURE

Temperature of axle lubricant in rear rear drive axle.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 1.2 °F
Maximum Range: 0.0 to 306.0 °F
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
78	a
a—	Rear rear drive axle temperature

A.79 ROAD SURFACE TEMPERATURE

Indicated temperature of road surface over which vehicle is operating.

Parameter Data Length: 1 Character
Data Type: Signed Short Integer
Bit Resolution: 2.5 °F
Maximum Range: –320.0 to +317.5 °F
Transmission Update Period: 10.0 s
Message Priority: 7
Format:

PID	Data
75	a
a—	Steering axle temperature

NOTE: See also PID 410.

A.80 WASHER FLUID LEVEL

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

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.5%
Maximum Range: 0.0 to 127.5%
Transmission Update Period: 10.0 s
Message Priority: 7
Format:

PID	Data
80	a
a—	Washer fluid level

A.81 PARTICULATE TRAP INLET PRESSURE

Exhaust back pressure as a result of particle accumulation on filter media placed in the exhaust stream.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.169 kPa (0.05 in Hg)
Maximum Range: 0.0 to 43.1 kPa (0.0 to 12.75 in Hg)
Transmission Update Period: 10.0 s
Message Priority: 7
Format:

PID	Data
81	a
a—	Particulate trap inlet pressure

A.82 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.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 4.14 kPa (0.6 lbf/in^2)
Maximum Range: 0.0 to 1055 kPa (0.0 to 153 lbf/in^2)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
82	a
a—	Air start pressure

A.83 ROAD SPEED LIMIT STATUS

State (active or not active) of the system used to limit maximum vehicle velocity.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
83	a
a—	Road speed limit status
	Bit 8: 1=active/0=not active
	Bits 7-1: Undefined

A.84 ROAD SPEED

Indicated vehicle velocity.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.805 km/h (0.5 mph)
Maximum Range: 0.0 to 205.2 km/h (0.0 to 127.5 mph)
Transmission Update Period: 0.1 s
Message Priority: 1
Format:

PID	Data
84	a
a—	Road speed

A.85 CRUISE CONTROL STATUS

State of the vehicle velocity control system (active, not active), and system switch (on, off), for various system operating modes.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: 0.2 s
Message Priority: 3
Format:

PID	Data		
85	a		
a—	Cruise control status		
	Bit 8:	cruise mode	1=active/0=not active
	Bit 7:	clutch switch	1=on/0=off
	Bit 6:	brake switch	1=on/0=off
	Bit 5:	accel switch	1=on/0=off
	Bit 4:	resume switch	1=on/0=off
	Bit 3:	coast switch	1=on/0=off
	Bit 2:	set switch	1=on/0=off
	Bit 1:	cruise control switch	1=on/0=off

A.86 CRUISE CONTROL SET SPEED

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

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.805 km/h (0.5 mph)
Maximum Range: 0.0 to 205.2 km/h (0.0 to 127.5 mph)
Transmission Update Period: 10.0 s
Message Priority: 6
Format:

PID	Data
86	a
a—	Cruise control set speed

A.87 CRUISE CONTROL HIGH SET LIMIT SPEED

Maximum vehicle velocity allowed at any cruise control set speed.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.805 km/h (0.5 mph)
Maximum Range: 0.0 to 205.2 km/h (0.0 to 127.5 mph)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
87	a
a—	Cruise control high set limit speed

A.88 CRUISE CONTROL LOW SET LIMIT SPEED

Minimum vehicle velocity allowed by cruise control before a speed adjustment is called for.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.805 km/h (0.5 mph)
Maximum Range: 0.0 to 205.2 km/h (0.0 to 127.5 mph)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
88	a
a—	Cruise control low set limit speed

A.89 POWER TAKEOFF STATUS

State of the system used to transmit engine power to auxiliary equipment. Status indication is for system (active, not active), and system switch (on, off), for various operating modes.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data		
89	a		
a—	Power takeoff status		
	Bit 8:	PTO mode	1=active/0=not active
	Bit 7:	clutch switch	1=on/0=off
	Bit 6:	brake switch	1=on/0=off
	Bit 5:	accel switch	1=on/0=off
	Bit 4:	resume switch	1=on/0=off
	Bit 3:	coast switch	1=on/0=off
	Bit 2:	set switch	1=on/0=off
	Bit 1:	PTO control switch	1=on/0=off

A.90 POWER TAKEOFF OIL TEMPERATURE

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

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 1.2 °F
Maximum Range: 0.0 to 306.0 °F
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
90	a
a—	Power takeoff oil temperature

A.91 PERCENT ACCELERATOR PEDAL POSITION

Ratio of actual accelerator pedal position to maximum pedal position.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.4%
Maximum Range: 0.0 to 102.0%
Transmission Update Period: 0.1 S
Message Priority: 3
Format:

PID	Data
91	a
a—	Percent accelerator pedal position

NOTE: See PIDs 28 and 29 for additional accelerator position parameters. If only one accelerator position exists on a vehicle, this PID should be used.

A.92 PERCENT ENGINE LOAD

Ratio of current output torque to maximum torque available at the current engine speed.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.5%
Maximum Range: 0.0 to 127.5%
Transmission Update Period: 0.1 s
Message Priority: 3
Format:

PID	Data
92	a
a—	Percent engine load

A.93 OUTPUT TORQUE

Amount of torque available at the engine flywheel.

Parameter Data Length: 1 Character
Data Type: Signed Short Integer
Bit Resolution: 27.1 N·m (20 lbf-ft)
Maximum Range: –3471 to +3444 N·m (–2560 to +2540 lbf-ft)
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
93	a
a—	Output torque

A.94 FUEL DELIVERY PRESSURE

Gage pressure of fuel in system as delivered from supply pump to the injection pump.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 3.45 kPa (0.5 lbf/in^2)
Maximum Range: 0.0 to 879.0 kPa (0.0 to 127.5 lbf/in^2)
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
94	a
a—	Fuel delivery pressure

NOTE: See PIDs 19 and 135 for alternate range and/or bit resolution.

A.95 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.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 1.724 kPa (0.25 lbf/in^2)
Maximum Range: 0.0 to 439.5 kPa (0.0 to 63.75 lbf/in^2)
Transmission Update Period: 10.0 s
Message Priority: 7
Format:

PID	Data
95	a
a—	Fuel filter differential pressure

NOTE: See also PID 16.

A.96 FUEL LEVEL

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

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.5%
Maximum Range: 0.0 to 127.5%
Transmission Update Period: 10.0 s
Message Priority: 6
Format:

PID	Data
96	a
a—	Fuel level

NOTE: See PID 38 for the second (right side) fuel level.

A.97 WATER IN FUEL INDICATOR

Indication (yes/no) of presence of unacceptable amount of water in fuel system.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: 10.0 s
Message Priority: 7
Format:

PID	Data
97	a
a—	Water in fuel indicator
	Bit 8: 1=yes/0=no
	Bits 7-1: Undefined

A.98 ENGINE OIL LEVEL

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

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.5%
Maximum Range: 0.0 to 127.5%
Transmission Update Period: 10.0 s
Message Priority: 6
Format:

PID	Data
98	a
a—	Engine oil level

A.99 ENGINE OIL FILTER DIFFERENTIAL PRESSURE

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

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.431 kPa (0.0625 lbf/in^2)
Maximum Range: 0.0 to 109.9 kPa (0.0 to 15.9375 lbf/in^2)
Transmission Update Period: 10.0 s
Message Priority: 6
Format:

PID	Data
99	a
a—	Oil filter differential pressure

A.100 ENGINE OIL PRESSURE

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

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 3.45 kPa (0.5 lbf/in^2)
Maximum Range: 0.0 to 879.0 kPa (0.0 to 127.5 lbf/in^2)
Transmission Update Period: 1.0 s
Message Priority: 2
Format:

PID	Data
100	a
a—	Engine oil pressure

NOTE: See PID 19 for alternate range and bit resolution. See PID 23 for generator oil pressure.

A.101 CRANKCASE PRESSURE

Gage air pressure inside engine crankcase.

Parameter Data Length: 1 Character
Data Type: Signed Short Integer
Bit Resolution: 0.862 kPa (0.125 lbf/in^2)
Maximum Range: –110.0 to +109.5 kPa (–16.00 to +15.875 lbf/in^2)
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
101	a
a—	Crankcase pressure

NOTE: See PID 153 for alternate bit resolution.

A.102 BOOST PRESSURE

Gage pressure of air measured downstream on the compressor discharge side of the turbocharger.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.862 kPa (0.125 lbf/in^2)
Maximum Range: 0.0 to 219.8 kPa (0.0 to 31.875 lbf/in^2)
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
102	a
a—	Boost pressure

NOTE: See PIDs 439 and 440 for alternate range and resolution.

A.103 TURBOCHARGER #1 SPEED

Rotational velocity of rotor in turbocharger.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 500 rpm
Maximum Range: 0 to 127500 rpm
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
103	a
a—	Turbocharger speed

A.104 TURBO OIL PRESSURE

Gage pressure of oil in turbocharger lubrication system.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 4.14 kPa (0.6 lbf/in^2)
Maximum Range: 0.0 to 1055 kPa (0.0 to 153 lbf/in^2)
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
104	a
a—	Turbo oil pressure

A.105 INTAKE MANIFOLD TEMPERATURE

Temperature of precombustion air found in intake manifold of engine air supply system.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 1.0 °F
Maximum Range: 0.0 to 255.0 °F
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
105	a
a—	Intake manifold temperature

A.106 AIR INLET PRESSURE

Absolute air pressure at inlet to intake manifold or air box.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 1.724 kPa (0.25 lbf/in^2)
Maximum Range: 0.0 to 439.5 kPa (0.0 to 63.75 lbf/in^2)
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
106	a
a—	Air inlet pressure

A.107 AIR FILTER DIFFERENTIAL PRESSURE

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

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.0498 kPa (0.2 in H_2O)
Maximum Range: 0.0 to 12.7 kPa (0.0 to 51.0 in H_2O)
Transmission Update Period: 10.0 s
Message Priority: 7
Format:

PID	Data
107	a
a—	Air filter differential pressure

A.108 BAROMETRIC PRESSURE

Absolute air pressure of the atmosphere.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.431 kPa (0.0625 lbf/in^2)
Maximum Range: 0.0 to 109.9 kPa (0.0 to 15.9375 lbf/in^2)
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
108	a
a—	Barometric pressure

NOTE: See PID 48 for alternate bit resolution.

A.109 COOLANT PRESSURE

The gage pressure of liquid found in engine cooling system.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.862 kPa (0.125 lbf/in^2)
Maximum Range: 0.0 to 219.8 kPa (0.0 to 31.875 lbf/in^2)
Transmission Update Period: 10.0 s
Message Priority: 6
Format:

PID	Data
109	a
a—	Coolant pressure

NOTE: See PID 20 for alternate range and bit resolution.

A.110 ENGINE COOLANT TEMPERATURE

The temperature of liquid found in engine cooling system.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 1.0 °F
Maximum Range: 0.0 to 255.0 °F
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
110	a
a—	Engine coolant temperature

See PID 24 for generator coolant temperature.

A.111 COOLANT LEVEL

Ratio of volume of liquid found in engine cooling system to total cooling system volume.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.5%
Maximum Range: 0.0 to 127.5%
Transmission Update Period: 10.0 s
Message Priority: 7
Format:

PID	Data
111	a
a—	Coolant level

NOTE: For a two switch system, the first switch is identified by this PID. The second switch is identified by engine SID number 312. Refer to manufacturer specific information for the Add Level and the Critically Low Level switch designations. (Associated with Engine MIDs 128, 175, 183, 184, 185, 186).

A.112 COOLANT FILTER DIFFERENTIAL PRESSURE

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

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.431 kPa (0.0625 lbf/in^2)
Maximum Range: 0.0 to 109.9 kPa (0.0 to 15.9375 lbf/in^2)
Transmission Update Period: 10.0 s
Message Priority: 6
Format:

PID	Data
112	a
a—	Coolant filter differential pressure

A.113 GOVERNOR DROOP

The difference between full load rated engine speed and maximum no-load governed engine speed.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 2.0 rpm
Maximum Range: 0.0 to 510.0 rpm
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
113	a
a—	Governor drop

A.114 NET BATTERY CURRENT

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

Parameter Data Length: 1 Character
Data Type: Signed Short Integer
Bit Resolution: 1.2 A
Maximum Range: –153.6 to +152.0 A
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
114	a
a—	Net battery count

A.115 ALTERNATOR CURRENT

Measure of electrical flow from the alternator.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 1.2 A
Maximum Range: 0.0 to 306 A
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
115	a
a—	Alternator current

A.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).

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 4.14 kPa (0.6 lbf/in^2)
Maximum Range: 0.0 to 1055 kPa (0.0 to 153.0 lbf/in^2)
Transmission Update Period: 0.2 s
Message Priority: 1
Format:

PID	Data
116	a
a—	Brake application pressure

A.117 BRAKE PRIMARY PRESSURE

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

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 4.14 kPa (0.6 lbf/in^2)
Maximum Range: 0.0 to 1055 kPa (0.0 to 153.0 lbf/in^2)
Transmission Update Period: 1.0 s
Message Priority: 1
Format:

PID	Data
117	a
a—	Brake primary pressure

A.118 BRAKE SECONDARY PRESSURE

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

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 4.14 kPa (0.6 lbf/in^2)
Maximum Range: 0.0 to 1055 kPa (0.0 to 153.0 lbf/in^2)
Transmission Update Period: 1.0 s
Message Priority: 1

PID	Data
118	a
a—	Brake secondary pressure

A.119 HYDRAULIC RETARDER PRESSURE

Gage pressure of oil in hydraulic retarder system.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 4.14 kPa (0.6 lbf/in^2)
Maximum Range: 0.0 to 1055 kPa (0.0 to 153.0 lbf/in^2)
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
119	a
a—	Hydraulic retarder pressure

A.120 HYDRAULIC RETARDER OIL TEMPERATURE

The temperature of the oil in the hydraulic retarder system.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 2 °F
Maximum Range: 0.0 to 510 °F
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
120	a
a—	Hydraulic retarder oil temperature

A.121 ENGINE RETARDER STATUS

State of device used to convert engine power to vehicle retarding (stopping) force.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: 0.2 s
Message Priority: 3
Format:

PID	Data
121	a
a—	Engine retarder status Bit 8: 1=on/0=off Bit 7: undefined Bit 6: undefined Bit 5: 1=8 cylinder active/0=8 cylinder not active Bit 4: 1=6 cylinder active/0=6 cylinder not active Bit 3: 1=4 cylinder active/0=4 cylinder not active Bit 2: 1=3 cylinder active/0=3 cylinder not active Bit 1: 1=2 cylinder active/0=2 cylinder not active

A.122 ENGINE RETARDER PERCENT

Ratio of current engine retard force to maximum retard force available.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.5%
Maximum Range: 0.0 to 127.5%
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
122	a
a—	Engine retarder percent

A.123 CLUTCH PRESSURE

Gage pressure of oil within a wet clutch.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 13.8 kPa (2.0 lbf/in^2)
Maximum Range: 0.0 to 3516 kPa (0.0 to 510.0 lbf/in^2)
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
123	a
a—	Clutch pressure

A.124 TRANSMISSION OIL LEVEL

Ratio of volume of transmission sump oil to recommended volume.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.5%
Maximum Range: 0.0 to 127.5%
Transmission Update Period: 10.0 s
Message Priority: 7
Format:

PID	Data
124	a
a—	Transmission oil level

A.125 TRANSMISSION OIL LEVEL HIGH/LOW

Amount of current volume of transmission sump oil compared to recommended volume.

Parameter Data Length: 1 Character
Data Type: Signed Short Integer
Bit Resolution: 0.473 L (1.0 pt)
Maximum Range: –60.6 to 60.1 L (–128 to +127 pt)
Transmission Update Period: 10.0 s
Message Priority: 6
Format:

PID	Data
125	a
a—	Transmission oil level High/Low

A.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.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 1.724 kPa (0.25 lbf/in^2)
Maximum Range: 0.0 to 439.5 kPa (0.0 to 63.75 lbf/in^2)
Transmission Update Period: 10.0 s
Message Priority: 7
Format:

PID	Data
126	a
a—	Transmission filter differential pressure

A.127 TRANSMISSION OIL PRESSURE

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

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 13.8 kPa (2.0 lbf/in^2)
Maximum Range: 0.0 to 3516 kPa (0.0 to 510.0 lbf/in^2)
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
127	a
a—	Transmission oil pressure

A.128 COMPONENT SPECIFIC PARAMETER REQUEST

Used to request parameter data transmissions from a specified component on the data link.

Parameter Data Length: 2 Characters
Data Type: Unsigned Short Integer (both characters)
Resolution: Binary (both characters)
Maximum Range: 0 to 255 (both characters)
Transmission Update Period: As needed
Message Priority: 8
Format:

PID	Data
128	a b
a—	Parameter number of the requested parameter
b—	MID of the component from which the parameter data is requested

Only the specified component should transmit the specified parameter. If the specified component is in the MID range 0 to 127, its response is not defined in this document.

A.129 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 inlet.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.689 kPa (0.1 lbf/in^2)
Maximum Range: 0.0 to 45153.6 kPa (0.0 to 6553.5 lbf/in^2)
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
129	a a
a a—	Injector metering rail #2 pressure

A.130 POWER SPECIFIC FUEL ECONOMY

Instantaneous fuel economy of the engine, typically for off-highway equipment.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 1.97 x 10^{-3} kW·h/L (0.01 hp·h/gal)
Maximum Range: 0.0 to 129.1 kW·h/L (0.0 to 655.35 hp·h/gal)
Transmission Update Period: 1 s
Message Priority: 3
Format:

PID	Data
130	a a
a a—	Power specific fuel economy

NOTE: See PID 184 for alternate bit resolution.

A.131 EXHAUST BACK PRESSURE

Gage pressure of exhaust gas measured at the exhaust manifold.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 6.733 x 10^{-3} kPa (1/1024 lbf/in^2)
Maximum Range: 0.0 to 441.258 kPa (0.0 to 63.999 lbf/in^2)
Transmission Update Period: 1 s
Message Priority: 4
Format:

PID	Data
131	a a
a a—	Exhaust back pressure

A.132 MASS AIR FLOW

Mass air flow measured at the fresh air intake.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.125 kg/min (0.2756 lb/min)
Maximum Range: 0.0 to 8192.875 kg/min (0.0 to 18059.99 lb/min)
Transmission Update Period: 1 s
Message Priority: 4
Format:

PID	Data
132	a a
a a—	Mass air flow

A.133 AVERAGE FUEL RATE

Continuous averaging of gallons of fuel per hour per segment of engine operation. The average period and reset options are to be defined in the manufacturer's application document.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 16.428 x 10^{-6} L/s (4.34 x 10^{-6} gal/s or 1/64 gal/h)
Maximum Range: 0.0 to 1.07665 L/s (0.0 to 0.28442190 gal/s or 0.0 to 1023.98 gal/h)
Transmission Update Period: 0.2 s
Message Priority: 3
Format:

PID	Data
133	a a

a a— Average fuel rate

A.134 WHEEL SPEED SENSOR STATUS

Identifies the current state of the device that signals individual wheel speeds to the ABS Electronic control Unit.

Parameter Data Length: 2 Characters
Data Type: Binary Bit Mapped
Resolution: Binary
Maximum Range: 0 to 255 (each character)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
134	a b

a— Wheel speed sensor status: left side
- Bits 8-7: Wheel sensor ABS axle: 1 left
- Bits 6-5: Wheel sensor ABS axle: 2 left
- Bits 4-3: Wheel sensor ABS axle: 3 left
- Bits 2-1: Wheel sensor ABS axle: 4 left

b— Wheel speed sensor status: right side
- Bits 8-7: Wheel sensor ABS axle: 1 right
- Bits 6-5: Wheel sensor ABS axle: 2 right
- Bits 4-3: Wheel sensor ABS axle: 3 right
- Bits 2-1: Wheel sensor ABS axle: 4 right

NOTE: Each status will be described using the following nomenclature:

00	Off/Not active (Sensor present/No active signal)
01	On/Active (Sensor present/Active signal)
10	Error condition (Sensor present/Error condition detected)
11	Not available (Sensor not present)

A.135 EXTENDED RANGE FUEL DELIVERY PRESSURE (ABSOLUTE)

Absolute pressure of fuel in system delivered from the supply pump.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.689 kPa (0.1 lbf/in^2)
Maximum Range: 0.0 to 45153.6 kPa (0.0 to 6553.5 lbf/in^2)
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
135	a a
a a—	Extended Range Fuel Delivery Pressure (Absolute)

NOTE: See PID 94 for alternate bit resolution.

A.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 existing PIDs.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.689 kPa (0.1 lbf/in^2)
Maximum Range: 0.0 to 45153.6 kPa (0.0 to 6553.5 lbf/in^2)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
136	a a
a—	Auxiliary Vacuum Pressure Reading

A.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 existing PIDs.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.689 kPa (0.1 lbf/in^2)
Maximum Range: 0.0 to 45153.6 kPa (0.0 to 6553.5 lbf/in^2)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
137	a a
a a—	Auxiliary Gage pressure reading #1

NOTE: See also PID 443.

A.138 AUXILIARY ABSOLUTE PRESSURE READING

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

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.689 kPa (0.1 lbf/in^2)
Maximum Range: 0.0 to 45153.6 kPa (0.0 to 6553.5 lbf/in^2)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
138	a a

a a— Auxiliary Absolute Pressure Reading

A.139 TIRE PRESSURE CONTROL SYSTEM CHANNEL FUNCTIONAL MODE

Indicates the functional mode of each channel.

Parameter Data Length: 2 Characters
Data Type: Binary Bit-Mapped
Bit Resolution: Binary
Maximum Range: 0 to 65535
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
139	a b

a— Tire pressure control system functional mode #1
Bits 8-5: Reserved—all bits set to 1
Bits 4-1: Steer channel mode

b— Tire pressure control system functional mode #2
Bits 8-5: Drive channel mode
Bits 4-1: Trailer/tag channel mode

NOTE: Each status will be described using the following nomenclature:

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

A.140 TIRE PRESSURE CONTROL SYSTEM SOLENOID STATUS

Identifies the current state of the solenoids used to implement a tire pressure control system in its pneumatic control unit (PCU).

Parameter Data Length: 2 Characters
Data Type: Binary Bit-Mapped
Bit Resolution: Binary
Maximum Range: 0 to 65535
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
140	a b
a—	Tire pressure control system solenoid status #1
	Bits 8-5: Reserved—all bits set to 1
	Bits 4-3: PCU steer solenoid status
	Bits 2-1: PCU drive solenoid status
b—	Tire pressure control system solenoid status #2
	Bits 8-7: PCU trailer, tag, or push solenoid status
	Bits 6-5: PCU supply solenoid status
	Bits 4-3: PCU control solenoid status
	Bits 2-1: PCU deflate solenoid status

NOTE: Each status will be described using the following nomenclature:

00	Off
00	On
10	Error condition
11	Not available

A.141 TRAILER #1, TAG #1, OR PUSH CHANNEL #1 TIRE PRESSURE TARGET

The tire pressure control system's target gage pressure for the trailer #1, tag #1, or push #1 group of tires.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.689 kPa (0.1 lbf/in^2)
Maximum Range: 0.0 to 45153.6 kPa (0.0 to 6553.5 lbf/in^2)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
141	a a
a a—	Trailer #1, tag #1, or push #1 tire pressure target

NOTE: See also PID 437.

A.142 DRIVE CHANNEL TIRE PRESSURE TARGET

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

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.689 kPa (0.1 lbf/in^2)
Maximum Range: 0.0 to 45153.6 kPa (0.0 to 6553.5 lbf/in^2)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
142	a a
a—	Drive channel tire pressure target

A.143 STEER CHANNEL TIRE PRESSURE TARGET

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

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.689 kPa (0.1 lbf/in^2)
Maximum Range: 0.0 to 45153.6 kPa (0.0 to 6553.5 lbf/in^2)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
143	a a
a—	Steer channel tire pressure target

A.144 TRAILER #1, TAG #1, OR PUSH CHANNEL #1 TIRE PRESSURE

The latest gage pressure reading of the trailer #1, tag #1, or push #1 group of tires, as opposed to the pressure in each tire.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.689 kPa (0.1 lbf/in^2)
Maximum Range: 0.0 to 45153.6 kPa (0.0 to 6553.5 lbf/in^2)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
144	a a
a a—	Trailer #1, tag #1, or push #1 tire pressure

NOTE: See also PID 438.

A.145 DRIVE CHANNEL TIRE PRESSURE

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

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.689 kPa (0.1 lbf/in^2)
Maximum Range: 0.0 to 45153.6 kPa (0.0 to 6553.5 lbf/in^2)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
145	a a
a—	Drive channel tire pressure

A.146 STEER CHANNEL TIRE PRESSURE

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

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.689 kPa (0.1 lbf/in^2)
Maximum Range: 0.0 to 45153.6 kPa (0.0 to 6553.5 lbf/in^2)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
146	a a
a—	Steer channel tire pressure

A.147 AVERAGE FUEL ECONOMY (NATURAL GAS)

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

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 1/512 km/kg (1/1816.6 m/lb)
Maximum Range: 0.0 to 127.998 km/kg (0.0 to 36.076 m/lb)
Transmission Update Period: 10.0 s
Message Priority: 7
Format:

PID	Data
147	a a
a—	Average fuel economy (natural gas)

NOTE: See PID 185 for alternate units.

A.148 INSTANTANEOUS FUEL ECONOMY (NATURAL GAS)

Current fuel economy at current vehicle velocity.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 1/512 km/kg (1/1816.6 m/lb)
Maximum Range: 0.0 to 127.998 km/kg (0.0 to 36.076 m/lb)
Transmission Update Period: 0.2 s
Message Priority: 3
Format:

PID	Data
148	a a
a—	Instantaneous fuel economy (natural gas)

NOTE: See PID 184 for alternate units.

A.149 MASS FLOW RATE (NATURAL GAS)

Amount of fuel consumed by engine per unit of time.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.125 kg/h (0.275 lb/h)
Maximum Range: 0.0 to 8191.875 kg/h (0.0 to 18022.125 lb/h)
Transmission Update Period: 0.2 s
Message Priority: 3
Format:

PID	Data
149	a a
a—	Fuel mass flow rate (natural gas)

NOTE: See PID 183 for alternate units.

A.150 PTO ENGAGEMENT CONTROL STATUS

Identifies the current state of the input and output functions used to control the engagement of PTO devices.

Parameter Data Length: 2 Characters
Data Type: Binary Bit-Mapped
Bit Resolution: Binary
Maximum Range: 0 to 65535
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
150	a b
a—	PTO input status Bits 8-7: PTO #4 engagement control switch status Bits 6-5: PTO #3 engagement control switch status
b—	PTO output status Bits 8-7: PTO #4 engagement actuator status Bits 6-5: PTO #3 engagement actuator status

NOTE: Each status will be described using the following nomenclature:

00	Off/Not active
01	On/Active
10	Error condition
11	Not available

A.151 ATC CONTROL STATUS

Identifies the current state of the ATC control functions, signals, lamp, and switch.

Parameter Data Length: 2 Characters
Data Type: Binary Bit-Mapped
Bit Resolution: Binary
Maximum Range: 0 to 65535
Transmission Update Period: 0.5 s
Message Priority: 3
Format:

PID	Data
151	a b
a—	ATC control status #1
	Bits 8-7: ATC spin-out signal detection
	Bits 6-5: ATC engine control
	Bits 4-3: ATC brake control
	Bits 2-1: ATC status lamp
b—	ATC control status #2
	Bits 8-7: Reserved
	Bits 6-5: VDC engine control
	Bits 4-3: VDC brake control
	Bits 2-1: ATC deep snow/mud function switch

NOTE 1: Each status will be described using the following nomenclature:

00	Off/Not active
01	On/Active
10	Error condition
11	Not available

NOTE 2: VDC is defined as vehicle dynamic stability control.

A.152 NUMBER OF ECU RESETS

The number of times the ECU has completed a successful power-up sequence.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 1
Maximum Range: 0 to 65535
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
152	a a
a—	Number of ECU resets

A.153 CRANKCASE PRESSURE

Gage air pressure inside engine crankcase.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 7.8125 x 10^{-3} kPa (1.133 x 10^{-3} lbf/in^2)
Maximum Range: –256.00 to +255.99 kPa (–37.13 to +37.12 lbf/in^2)
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
153	a a
a—	Crankcase pressure

NOTE: See PID 101 for alternate bit resolution.

A.154 AUXILIARY INPUT AND OUTPUT STATUS #2

Identifies the current status of auxiliary input and output functions that are configured uniquely per application. Not to be used in place of existing PIDs.

Parameter Data Length: 2 Characters
Data Type: Binary Bit-mapped
Bit Resolution: Binary
Maximum Range: 0 to 65535
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
154	a b
a—	Auxiliary input status Bits 8-7: Auxiliary input #8 Bits 6-5: Auxiliary input #7 Bits 4-3: Auxiliary input #6 Bits 2-1: Auxiliary input #5
b—	Auxiliary output status Bits 8-7: Auxiliary output #8 Bits 6-5: Auxiliary output #7 Bits 4-3: Auxiliary output #6 Bits 2-1: Auxiliary output #5

NOTE: Each status will be described using the following nomenclature:

00	Off
01	On
10	Error condition
11	Not available

A.155 AUXILIARY INPUT AND OUTPUT STATUS #1

Identifies the current status of auxiliary input and output functions that are configured uniquely per application. Not to be used in place of existing PIDs.

Parameter Data Length: 2 Characters
Data Type: Binary Bit-mapped
Bit Resolution: Binary
Maximum Range: 0 to 65535
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
155	a b
a—	Auxiliary input status
	Bits 8-7: Auxiliary input #4
	Bits 6-5: Auxiliary input #3
	Bits 4-3: Auxiliary input #2
	Bits 2-1: Auxiliary input #1
b—	Auxiliary output status
	Bits 8-7: Auxiliary output #4
	Bits 6-5: Auxiliary output #3
	Bits 4-3: Auxiliary output #2
	Bits 2-1: Auxiliary output #1

NOTE: Each status will be described using the following nomenclature:

00	Off
01	On
10	Error condition
11	Not available

A.156 INJECTOR TIMING RAIL PRESSURE

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

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.689 kPa (0.1 lbf/in^2)
Maximum Range: 0.0 to 45153.6 kPa (0.0 to 6553.5 lbf/in^2)
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
156	a a
a a—	Injector timing rail pressure

A.157 INJECTOR METERING RAIL PRESSURE

The gage pressure of fuel in the metering rail as delivered from the supply pump to the injector metering inlet.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.689 kPa (0.1 lbf/in^2)
Maximum Range: 0.0 to 45153.6 kPa (0.0 to 6553.5 lbf/in^2)
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
157	a a
a a—	Injector metering rail pressure

A.158 BATTERY POTENTIAL (VOLTAGE)—SWITCHED

Electrical potential measured at the input of the electronic control unit supplied through a switching device.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.05 V
Maximum Range: 0.0 to 3276.75 V
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
158	a a
a a—	Battery potential (voltage)—switched

A.159 GAS SUPPLY PRESSURE

Gas supply pressure (gage) to fuel metering device.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.345 kPa (0.05 lbf/in^2)
Maximum Range: 0.0 to 22609.6 kPa (0.0 to 3276.75 lbf/in^2)
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
159	a a
a a—	Gas supply pressure

A.160 MAIN SHAFT SPEED

Rotational velocity of the first intermediate shaft of the transmission.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.25 rpm
Maximum Range: 0.0 to 16383.75 rpm
Transmission Update Period: On request
Message Priority: 2
Format:

PID	Data
160	a a
a a—	Main shaft speed

A.161 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.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.25 rpm
Maximum Range: 0.0 to 16383.75 rpm
Transmission Update Period: On request
Message Priority: 2
Format:

PID	Data
161	a a
a a—	Input shaft speed

A.162 TRANSMISSION RANGE SELECTED

Range selected by the operator. Characters may include P, R2, R1, R, N, D, D1, D2, L, L1, L2, 1, 2, 3, ... If only one displayable character is required (ASCII 32 to 127), the second character shall be used and the first character shall be either 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.

Parameter Data Length: 2 Characters
Data Type: Alphanumeric
Resolution: ASCII
Maximum Range: 0 to 255 (each character)
Operating Range: 0 to 127 (each character)
Transmission Update Period: 0.5 s
Message Priority: 4
Format:

PID	Data
162	a a
a a—	Transmission range selected and/or control character

A.163 TRANSMISSION RANGE ATTAINED

Range currently being commanded by the transmission control system. Characters may include P, R2, R1, R, N, D, D1, D2, L, L1, L2, 1, 2, 3, ... If only one displayable character is required (ASCII 32 to 127), the second character shall be used and the first character shall be either 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.

Parameter Data Length: 2 Characters
Data Type: Alphanumeric
Resolution: ASCII
Maximum Range: 0 to 255 (each character)
Operating Range: 0 to 127 (each character)
Transmission Update Period: 0.5 s
Message Priority: 4
Format:

PID	Data
163	a a
a a—	Transmission range attained and/or control character

A.164 INJECTION CONTROL PRESSURE

The gage pressure of the hydraulic accumulator that powers fuel injection.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 1/256 MPa
Maximum Range: 0 to 255.996 MPa
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
164	a a
a a—	Injection control pressure

A.165 COMPASS BEARING

Present compass bearing of vehicle

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.01 degree
Maximum Range: 0.00 to 655.35 degree
Transmission Update Period: On request
Message Priority: 6
Format:

PID	Data
165	a a
a a—	Present compass bearing

A.166 RATED ENGINE POWER

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

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.745 kW (1.0 hp)
Maximum Range: 0.0 to 48869.4 kW (0.0 to 65535.0 hp)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
166	a a
a a—	Rated engine power

A.167 ALTERNATOR POTENTIAL (VOLTAGE)

Measured electrical potential of the alternator.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.05 V
Maximum Range: 0.0 to 3276.75 V
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
167	a a
a a—	Alternator potential

A.168 BATTERY POTENTIAL (VOLTAGE)

Measured electrical potential of the battery.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.05 V
Maximum Range: 0.0 to 3276.75 V
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
168	a a
a a—	battery potential (voltage)

NOTE: See also PID 444.

A.169 CARGO AMBIENT TEMPERATURE

Temperature of air inside vehicle container used to accommodate cargo.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 0.25 °F
Maximum Range: –8192.00 to +8191.75 °F
Transmission Update Period: 10.0 s
Message Priority: 6
Format:

PID	Data
169	a a
a a—	Cargo ambient temperature

NOTE: See also PID 435.

A.170 CAB INTERIOR TEMPERATURE

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

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 0.25 °F
Maximum Range: –8192.00 to +8191.75 °F
Transmission Update Period: 10.0 s
Message Priority: 7
Format:

PID	Data
170	a a
a a—	Cab interior temperature

A.171 AMBIENT AIR TEMPERATURE

Temperature of air surrounding vehicle.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 0.25 °F
Maximum Range: –8192.00 to +8191.75 °F
Transmission Update Period: 10.0 s
Message Priority: 7
Format:

PID	Data
171	a a
a a—	Ambient air temperature

A.172 AIR INLET TEMPERATURE

Temperature of air entering vehicle air induction system.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 0.25 °F
Maximum Range: –8192.00 to +8191.75 °F
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
172	a a
a a—	Air inlet temperature

A.173 EXHAUST GAS TEMPERATURE

Temperature of combustion byproducts leaving the engine.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 0.25 °F
Maximum Range: –8192.00 to +8191.75 °F
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
173	a a
a a—	Exhaust gas temperature

A.174 FUEL TEMPERATURE

Temperature of fuel entering injectors.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 0.25 °F
Maximum Range: –8192.00 to +8191.75 °F
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
174	a a
a a—	Fuel temperature

A.175 ENGINE OIL TEMPERATURE

Temperature of engine lubricant.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 0.25 °F
Maximum Range: –8192.00 to +8191.75 °F
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
175	a a
a a—	Engine oil temperature

A.176 TURBO OIL TEMPERATURE

Temperature of turbocharger lubricant.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 0.25 °F
Maximum Range: –8192.00 to +8191.75 °F
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
176	a a
a a—	Turbo oil temperature

A.177 TRANSMISSION #1 OIL TEMPERATURE

Temperature of transmission lubricant.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 0.25 °F
Maximum Range: –8192.00 to +8191.75 °F
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
177	a a
a a—	Transmission oil temperature

A.178 FRONT AXLE WEIGHT

Total force of gravity imposed by the front tires on the road surface.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 4.448 N (1.0 lbf)
Maximum Range: 0.0 to 291514.2 N (0.0 to 65535.0 lbf)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
178	a a
a a—	Front axle weight

A.179 REAR AXLE WEIGHT

Force of gravity imposed on the road surface by all the tires on each individual rear axle.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 4.448 N (1.0 lbf)
Maximum Range: 0.0 to 291514.2 N (0.0 to 65535.0 lbf)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
179	a a
a a—	Rear axle weight

A.180 TRAILER WEIGHT

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

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 17.792 N (4.0 lbf)
Maximum Range: 0.0 to 1166056.9 N (0.0 to 262140.0 lbf)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
180	a a
a a—	Trailer weight

A.181 CARGO WEIGHT

The force of gravity of freight carried.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 17.792 N (4.0 lbf)
Maximum Range: 0.0 to 1166056.9 N (0.0 to 262140.0 lbf)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
181	a a
a a—	Cargo weight

A.182 TRIP FUEL

Fuel consumed during all or part of a journey.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.473 L (0.125 gal)
Maximum Range: 0.0 to 31009.6 L (0.0 to 8191.875 gal)
Transmission Update Period: 10.0 s
Message Priority: 7
Format:

PID	Data
182	a a
a a—	Trip fuel

NOTE: See PID 231 for alternate units.

A.183 FUEL RATE (INSTANTANEOUS)

Amount of fuel consumed by engine per unit of time.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 16.428×10^{-6} L/s (4.34×10^{-6} gal/s or 1/64 gal/h)
Maximum Range: 0.0 to 1.07665 L/s (0.0 to 0.28442190 gal/s or 0.0 to 1023.98 gal/h)
Transmission Update Period: 0.2 s
Message Priority: 3
Format:

PID	Data
183	a a
a a—	Fuel rate (instantaneous)

NOTE: See PID 149 for alternate units.

A.184 INSTANTANEOUS FUEL ECONOMY

Current fuel economy at current vehicle velocity.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 1.66072 x 10^{-3} km/L (1/256 mpg)
Maximum Range: 0.0 to 108.835 km/L (0.0 to 255.996 mpg)
Transmission Update Period: 0.2 s
Message Priority: 3
Format:

PID	Data
184	a a
a a—	Instantaneous fuel economy

NOTE: See PID 148 for alternate units.

A.185 AVERAGE FUEL ECONOMY

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

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 1.66072 x 10^{-3} km/L (1/256 mpg)
Maximum Range: 108.835 km/L (0.0 to 255.996 mpg)
Transmission Update Period: 10.0 s
Message Priority: 7
Format:

PID	Data
185	a a
a a—	Average fuel economy

NOTE: See PID 147 for alternate units.

A.186 POWER TAKEOFF SPEED

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

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.25 rpm
Maximum Range: 0.0 to 16383.75 rpm
Transmission Update Period: 0.1 s
Message Priority: 2
Format:

PID	Data
186	a a
a a—	Power takeoff speed

A.187 POWER TAKEOFF SET SPEED

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

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.25 rpm
Maximum Range: 0.0 to 16383.75 rpm
Transmission Update Period: 10.0 s
Message Priority: 6
Format:

PID	Data
187	a a
a a—	Power takeoff set speed

A.188 IDLE ENGINE SPEED

Minimum nontransient rotational velocity of crankshaft while engine is supplying power to itself and its attendant support systems.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.25 rpm
Maximum Range: 0.0 to 16383.75 rpm
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
188	a a
a a—	Idle engine speed

A.189 RATED ENGINE SPEED

The maximum governed rotational velocity of the engine crankshaft under full load conditions.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.25 rpm
Maximum Range: 0.0 to 16383.75 rpm
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
189	a a
a a—	Rated engine speed

A.190 ENGINE SPEED

Rotational velocity of crankshaft.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.25 rpm
Maximum Range: 0.0 to 16383.75 rpm
Transmission Update Period: 0.1 s
Message Priority: 1
Format:

PID	Data
190	a a
a a—	Engine speed

A.191 TRANSMISSION OUTPUT SHAFT SPEED

Rotational velocity of shaft transferring force from transmission to driveshaft.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.25 rpm
Maximum Range: 0.0 to 16383.75 rpm
Transmission Update Period: 0.1 s
Message Priority: 2
Format:

PID	Data
191	a a
a a—	Transmission output shaft speed

A.192 MULTISECTION PARAMETER

Used to transmit parameters that are longer than what is limited by SAE J1708. A specified parameter can be broken into sections with each section being transmitted in a different message.

Parameter: Data Length: Variable
Data Type: Defined by specified sectioned parameter
Resolution: Defined by specified sectioned parameter
Maximum Range: Defined by specified sectioned parameter
Transmission Update Period: Defined by specified sectioned parameter
Message Priority: Parameter specific
Format:

PID	Data
192	n, a, b, c/d, c, c, c, c, c, c, c

n— Byte count of data within this section that follows this character. This excludes characters MID, PID 192, and n, but it includes a, b, c, or d type characters.

a— PID from page 1 (PIDs 0 to 254) specifying the parameter that has been selected.

b— The last section number (total number of sections minus ONE) and the current section number. The upper nibble contains the last section number (1 to 15). The lower nibble contains the current section number and is limited to the range 0 to 15. Section numbers are assigned in ascending order.

c— Data portion of sectioned parameters. May be 1 to 14 characters in the first packet, as byte d is transmitted only in the first packet. May be 1 to 15 characters in the middle and ending packets.

d— Total byte count of the original data. It is the same value as the byte count of the parameter being sectioned. This character is broadcast only in the first packet. The value must be greater than 17 but is limited to 239.

Application Notes:

1. Single sections of data are not allowed to be sent alone. Message packets must be sent in sequence from the transmitting device.

2. Receiver devices should have the capacity to receive concurrent PID 192 type messages from different transmitters.

3. Caution must be taken in interpreting data. The value of a parameter with multiple sections may have been updated during the time between which the packets are sent.

4. PID 192 is used to transmit a single PID whose length exceeds the message packet length limitation of SAE J1708. Message packets of type PID 192 may not include data from PIDs other than that given in byte 'a' of the first packet until all data of that PID has been transferred.

EXAMPLE: PID 192 response to a PID 243 request—

Character Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Section 1	MID	192	17	243	32	33	MID	MK	MK	MK	MK	MK	42	ML	ML	ML	ML	ML	ML	ML	cs
Section 2	MID	192	17	243	33	ML	ML	ML	42	SN	SN	SN	SN	SN	SN	SN	SN	SN	SN	SN	cs
Section 3	MID	192	6	243	34	SN	SN	SN	SN	cs											

FIGURE A1 - EXAMPLE - PID 192 RESPONSE TO A PID 243 REQUEST

NOTE 1: All Sections—Character number 3 is the byte count of this section. Character number 4 is the PID being sectioned. Character number 5 is the section number. A value of 32 (20_{16}) as shown in Section 1 indicates 3 sections and Section 1 is the 1st section.

NOTE 2: Section 1—Character 6 shows the total byte count of the original data, 33 in this example. The total byte count is only included in the first section. Character 7 is the MID of the component being identified. This is the first byte of the PID 243 data field. MK is the make, 5 characters in this example. The value of 42 in character number 13 is the ASCII "*" delimiter. ML is the model, 10 characters in this example. The first 7 characters of the model are in section 1 with the remainder in Section 2.

NOTE 3: Section 2—SN is the serial number, 15 characters in this example. The first 11 characters of the serial number are in section 2 with the remainder in section 3.

A.193 TRANSMITTER SYSTEM DIAGNOSTIC TABLE

Used to notify other components on the data link of the diagnostic condition of the transmitting electronic component. The parameter contains a list of diagnostic codes.

Parameter Data Length: Variable
Data Type: Defined by manufacturer application document
Resolution: Defined by manufacturer application document
Maximum Range: Defined by manufacturer application document
Transmission Update Period: Defined in application document
Message Priority: 8
Format:

PID	Data
193	n a a a a a a a a
n—	Byte count of data that follows this character
a—	Diagnostic codes defined by the component manufacturer in an application document.

The SAE Truck and Bus Subcommittee established PIDs 194 to 196 in May 1988; therefore, this Parameter ID should no longer be used by manufacturers in the design of new components. However, this parameter is being reserved for use by manufacturers who have developed systems prior to January 1989 and are, therefore, unable to accommodate the new diagnostic formats as defined in PIDs 194 to 196. It is recommended that manufacturers using this parameter fully define the contents and circumstances under which it is used in the application document.

A.194 TRANSMITTER SYSTEM DIAGNOSTIC CODE AND OCCURRENCE COUNT TABLE

Used to notify other components on the data link of the diagnostic condition of the transmitting electronic component. The parameter contains a list of diagnostic codes and occurrence counts.

Parameter Data Length: Variable
Data Type: Binary Bit-Mapped
Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: The diagnostic code is transmitted once whenever the fault becomes active and once whenever the fault becomes inactive but never more than once per second. All diagnostic codes are also available on request. All active diagnostic codes are retransmitted at a rate greater than or equal to the refresh rate of the associated PID but not greater than once per second. Active diagnostic codes for on-request PIDs and SIDs are transmitted at a rate of once every 15 s.
Message Priority: 8
Format:

PID	Data
194	n a b c a b c a b c a b c a b c a b c...

n— Byte count of data that follows this character. This excludes characters MID, PID 194, and n but includes a, b and c type characters.

a— SID or PID of a standard diagnostic code.

b— Diagnostic code character.

- Bit 8: Occurrence Count included
  - 1=count is included
  - 0=count not included
- Bit 7: Current Status of fault
  - 1=fault is inactive
  - 0=fault is active
- Bit 6: Type of diagnostic code
  - 1=standard diagnostic code
  - 0=expansion diagnostic code (PID or SID from page 2)
- Bit 5: Low character identifier for a standard diagnostic code
  - 1=low character is subsystem identifier (SID)
  - 0=low character is parameter identifier (PID)
- Bits 4-1: Failure mode identifier (FMI) of a standard diagnostic code

c— Occurrence count for the diagnostic code defined by the preceding 2 characters. The count is optional and bit 8 of the first character of the diagnostic code is used to determine if it is included.

Using the MID, FMI, and PID or SID associated with a diagnostic code, the control system which has the fault, which subsystem of the control system is failing, and how the subsystem is failing can be determined. The text used in SAE J1587 to describe the FMIs and SIDs should be used whenever a standard diagnostic code is being described. The use of common descriptions for the FMIs and SIDs is needed to allow the diagnostic codes to be interpreted consistently. The subsystem identification assignment list is shown in Table 6. The failure mode identifier assignment list is shown in Table 7.

1. If the diagnostic code PID is requested and there are no diagnostic codes, the response would be a PID 194 with the n set to 0.

2. If the length of the message would exceed the maximum message length allowable, PID 192 would be used and the data would be sent in a multisection transmission.

3. When the zero state of bit 6 of character b is used, the PID or SID identified in character a is from page 2 (PIDs 256 to 511). The value 256 should be added to the data in character a to determine the PID and SID value.

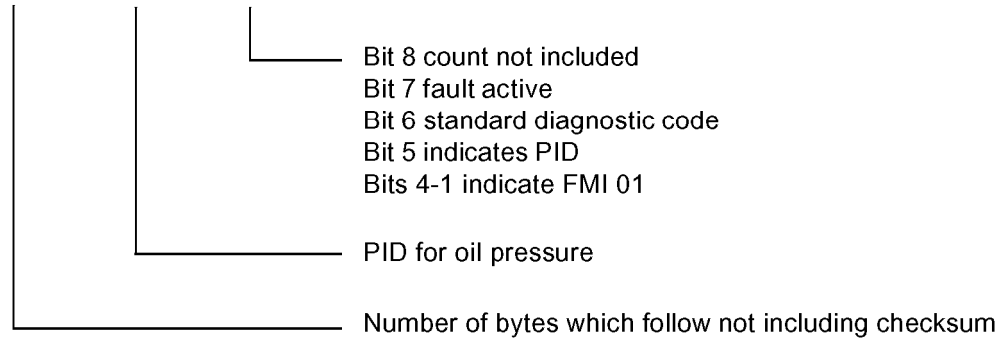
4. In the event the data is valid but detected to be above or below normal operating range, for example, the case of low oil pressure, the PID and its data will continue to be broadcast. In addition, a PID 194 with the offending PID will be broadcast per the above.

   EXAMPLE: Normal broadcast of engine speed (PID 190) and oil pressure (PID 100) prior to low oil pressure detection.

MID	PID	DATA	DATA	PID	DATA	CKSM	
128	190	32	28	100	70	220	Decimal
80	be	20	1c	64	46	dc	Hexadecimal

   Diagnostic broadcast, Oil pressure sensor data valid but below normal range.

MID	PID	DATA	DATA	DATA	CKSM	
128	194	02	100	33	55	Decimal
80	c2	02	64	21	37	Hexadecimal



   Next scheduled broadcast of engine speed (PID 190) and oil pressure (PID 100). Note that oil pressure continues to be broadcast.

MID	PID	DATA	DATA	PID	DATA	CKSM	
128	190	32	28	100	20	14	Decimal
80	be	20	1c	64	14	0e	Hexadecimal

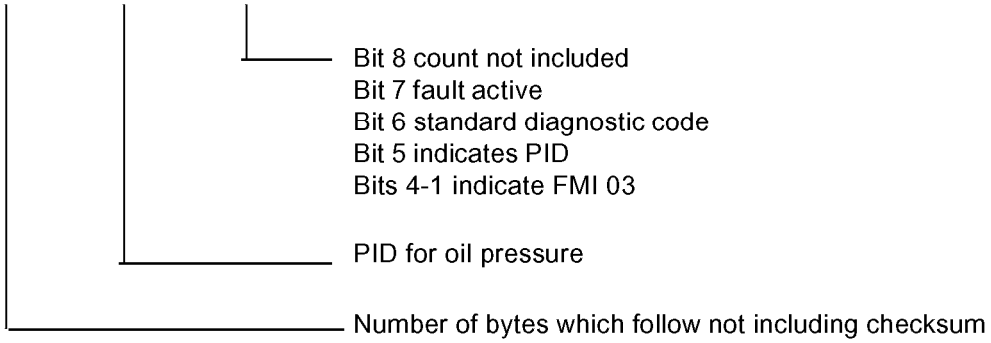
5. In the event the data is invalid, for example, the case of a shorted sensor, the PID at fault will not be broadcast. However, a PID 194 with the offending PID will be broadcast per the above.

   EXAMPLE: Normal broadcast of engine speed (PID 190) and oil pressure (PID 100) prior to oil pressure sensor failure.

MID	PID	DATA	DATA	PID	DATA	CKSM	
128	190	32	28	100	70	220	Decimal
80	be	20	1c	64	46	dc	Hexadecimal

Diagnostic broadcast, Oil pressure sensor shorted high.

MID	PID	DATA	DATA	DATA	CKSM	
128	194	02	100	35	53	Decimal
80	c2	02	64	23	35	Hexadecimal



Next scheduled broadcast of engine speed (PID 190). Oil pressure (PID 100) is not broadcast due to a failed sensor.

MID	PID	DATA	DATA	CKSM	
128	190	32	28	134	Decimal
80	be	20	1c	86	Hexadecimal

A.195 DIAGNOSTIC DATA REQUEST/CLEAR COUNT

Used to request additional information about a given diagnostic code or clear its count.

Parameter Data Length: 3 Characters
Data Type: Binary Bit-Mapped
Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: As needed
Message Priority: 8
Format:

PID	Data
195	n a b c

n— Number of parameter data characters = 3
a— MID of device to which request is directed.
b— SID or PID of a standard diagnostic code.
c— Diagnostic code character
- Bits 8-7: (00)—Request an ASCII descriptive message for the given SID or PID
  (01)—Request count be cleared for the given diagnostic code on the device with the given MID.
  (10)—Request counts be cleared for all diagnostic codes on the device with the given MID. The diagnostic code given in this transmission is ignored.
  (11)—Request additional diagnostic information for the given diagnostic code, the content of which is defined in a manufacturer's application document.
- Bit 6: Type of diagnostic code
  1=standard diagnostic code
  0=expansion diagnostic code (PID or SID from page 2)
- Bit 5: Low character identifier for a standard diagnostic code
  1=low character is subsystem identifier (SID)
  0=low character is parameter identifier (PID)
- Bits 4-1: Failure mode identifier (FMI) of a standard diagnostic code

A.196 DIAGNOSTIC DATA/COUNT CLEAR RESPONSE

Used to acknowledge the clearing of diagnostic codes or supply additional information about a diagnostic code as requested by PID 195.

Parameter Data Length: Variable
Data Type: Binary Bit-Mapped
Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: As needed
Message Priority: 8
Format:

PID Data
196 n a b c c c c c c c c c c ....

n— Byte count of data that follows this character. This excludes characters MID, PID 196, and n, but includes a, b, c type characters.

a— SID or PID of a standard diagnostic code.

b— Diagnostic code character

Bits 8-7: (00)—Message is an ASCII descriptive message for the given SID or PID.
(01)—The count has been cleared for the given diagnostic code.
(10)—All clearable diagnostic counts have been cleared for this device.
(11)—Message is additional diagnostic information for the given diagnostic code, the content of which is defined in a manufacturer's application document.

Bit 6: Type of diagnostic code
1=standard diagnostic code
0=expansion diagnostic code (PID or SID from page 2)

Bit 5: Low character identifier for a standard diagnostic code
1=low character is subsystem identifier (SID)
0=low character is parameter identifier (PID)

Bits 4-1: Failure mode identifier (FMI) of a standard diagnostic code.

c— If Bits 7 and 8 of character b are (00), the data in field C is an ASCII string, which describes the given SID or PID. If Bits 7 and 8 of character b are (11), the data in field C are defined by the manufacturer's application document with the exception that the first five characters of the data define the make of the component, which is responding. The five characters defining the make correspond to the codes defined in the American Trucking Association Vehicle Maintenance Reporting Standard (ATA/VMRS). It is suggested that spaces (ASCII 32) are used to fill the remaining characters if the ATA/VMRS make code is less than five characters in length. Data type c would be omitted if Bits 7 and 8 of character b are either (01) or (10) or if no data of the type requested is available.

Application Note: If the length of the message would exceed the maximum message length allowable, PID 192 would be used and the data would be sent in a multisection transmission.

A.197 COMMUNICATION MANAGEMENT

See Appendix B.

A.198 CONNECTION MODE DATA TRANSFER

See Appendix B.

A.199 TRACTION CONTROL DISABLE STATE

Used to request the traction control unit to temporarily disable the traction control function during vehicle testing.

Parameter Data Length: Variable
Data Type: Character 1 = Binary Bit-Mapped
Characters 2-x = Alphanumeric
Resolution: Character 1 = Binary
Characters 2-x = ASCII
Maximum Range: Character 1 = Binary
Characters 2-x = 0 to 255 (each character)
Transmission Update Period: 1 s (after initial request) or on request
Message Priority: 8
Format:

PID Data
199 n a b b b ...

n— Byte count of data that follows this character

a— Traction control disable state character

Bits 8-7: Request/response
(00)—Indicates that the message is a request directed to the traction control unit
(01)—Indicates that the message is a response from the traction control unit.
(10)—Error
(11)—Not viable.

Bit 6-4: Traction Control Active/Passive
(000)—Traction control function passive
(001)—Traction control differential braking function active
(010)—Traction control engine control function active
(011)—Traction control differential braking and engine control functions active
(100)—Reserved
(101)—Reserved
(110)—Error
(111)—Not available

Bit 3-1: Traction Control Function Enabled/Disabled
(000)—Traction control differential braking and engine control functions disabled
(001)—Traction control differential braking enabled
Traction control engine control function disabled
(010)—Traction control differential braking disabled
Traction control engine control function enabled
(011)—Traction control differential braking and engine control functions enabled
(100)—Reserved
(101)—Reserved
(110)—Error
(111)—Not available

b— Access code. An ASCII string of 0 to 15 bytes which is selected by the manufacturer of the traction control unit to protect the traction control function from becoming disabled by accident or due to malfunction of the requesting units.

NOTE 1: The traction control unit may have a switch that disables the engine control and/or the differential braking of the traction control function. If this switch is in the disable position, it may be impossible to enable the traction control function using this PID as this switch should have priority. Please contact the manufacturer of the traction control unit for more information.

NOTE 2: When PID 199 is requested by the off-board diagnostic or test unit using PID 0 or PID 128, the response from the traction control unit may contain an access code. This access code must be used by the off-board diagnostic or test unit in the request to disable traction control. The same access code should be used throughout a session. However, the access code may change from session to session. The manufacturer of the traction control unit must ensure that the traction control function is not disabled if the access code received from the diagnostic or test unit does not match its own access code. (There is no need for the off-board unit to program, into ROM, an access code for any manufacturer of a traction control unit.)

NOTE 3: Test Conditions—The traction control unit may disregard requests to enable or disable the traction control function when any measured wheel speed is above 0 km/h or when either or both of the traction control functions are active. If the traction control unit chooses to disregard a request, the proper response is to send NOT AVAILABLE for the request/response parameter bits.

NOTE 4: Traction Control Function Disabled Time-Out—After the traction control unit receives a request to disable the traction control function, the traction control unit may enable the traction control function after a time designated by the manufacturer of the traction control unit which is greater than 5 seconds. After this time, the traction control function will be allowed to revert to the normal operating mode, provided initial conditions have been met to return to normal operating mode. To ensure that the traction control function is disabled for the entire test or battery of tests, the off-board diagnostic of test units should transmit the request at an update rate of 1 second until the testing is completed.

NOTE 5: Traction Control Function Disabled Indication—The traction control unit must ensure that a visual indication is present when the traction control function has been disabled.

EXAMPLE:

MID 172 will be used for the off-board diagnostic unit in this example.
MID 136 will be used for the traction control unit in this example.
The access code ASCII '1234' will be used in this example.

1. The off-board diagnostic unit requests the traction control disable state PID from the traction control unit.

MID	PID	DATA	CKSM	
172	0	199	141	Decimal
ac	0	c7	8d	Hexadecimal

2. The traction control unit responds with the current traction control activity, enabled state, and access code.

MID	PID	DATA	DATA	DATA	DATA	DATA	DATA	CKSM	
136	199	5	3	49	50	51	52	223	Decimal
88	c7	5	3	31	32	33	34	df	Hexadecimal

Bits 8,7 indicate a response (00)
Bits 6-4 indicate the traction control function is passive (000)
Bits 3-1 indicate traction control functions are enabled (011)

3. The off-board diagnostic unit requests the traction control function to be disabled.

MID	PID	DATA	DATA	DATA	DATA	DATA	DATA	CKSM	
172	199	5	120	49	50	51	52	70	Decimal
ac	c7	5	78	31	32	33	34	46	Hexadecimal

Bits 8,7 indicate a request (01)
Bits 6-4 indicate information is not available (111)
Bits 3-1 request that traction control functions are to be disabled (000)

4. The traction control unit responds with the current traction control activity, enabled state and access code.

MID	PID	DATA	DATA	DATA	DATA	DATA	DATA	CKSM	
136	199	5	0	49	50	51	52	226	Decimal
88	c7	5	0	31	32	33	34	e2	Hexadecimal

Bits 8,7 indicate a response (00)
Bits 6-4 indicate the traction control function is passive (000)
Bits 3-1 indicate traction control functions are disabled (000)

5. If the traction control implements the optional time-out function as described in note #4, continue with the following procedure; however, it should be noted that to collect data, implement another function or start another test it may be necessary for the off-board diagnostic or test unit to update this message as a background task or another off-board diagnostic or test unit may be necessary.

MID	PID	DATA	DATA	DATA	DATA	DATA	DATA	CKSM	
172	199	5	120	49	50	51	52	70	Decimal
ac	c7	5	78	31	32	33	34	46	Hexadecimal

Bits 8,7 indicate a request (01)
Bits 6-4 indicate information is not available (111)
Bits 3-1 request that traction control functions are to be disabled (000)

6. The traction control unit responds with the current traction control activity, enabled state and access code.

MID	PID	DATA	DATA	DATA	DATA	DATA	DATA	CKSM	
136	199	5	0	49	50	51	52	226	Decimal
88	c7	5	0	31	32	33	34	e2	Hexadecimal

Bits 8,7 indicate a response (00)
Bits 6-4 indicate the traction control function is passive (000)
Bits 3-1 indicate traction control functions are disabled (000)

A.200 RESERVED

To be assigned.

A.201 RESERVED

To be assigned.

A.202 RESERVED

To be assigned.

A.203 PARTICULATE TRAP GAS OUTLET TEMPERATURE

Temperature of the air exiting the Particulate trap.

Parameter Data Length: 4 Characters
Data Type: Signed Integer
Bit Resolution: 0.25°F
Maximum Range: -8192.00 to +8191.75 °F
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
203	n a a a a

n— Number of parameter data characters = 4
a— Particulate Trap Gas Outlet Temperature

A.204 DATA TRANSFER MARKER, SAE J1587 / SAE J2497 (PAGE 1)

See Appendix F.

A.205 TIME POINT ENCOUNTER

Used to transfer schedule information about designated time points along a route.

Parameter Data Length: 8 Characters
Data Type: Unsigned Short Integer
Bit Resolution: Character 1 = Integer
Character 2-5 = Long Integer
Character 6 = 0.25 s/bit
Character 7 = 1 min/bit
Character 8 = 1 h/bit
Maximum Range: Character 1 = 0-255
Character 2-5 = 0 to 4294967295
Character 6 = 0 to 63.75 s
Character 7 = 0 to 255 min
Character 8 = 0 to 255 h
Transmission Update Period: As needed
Message Priority: 8
Format:

PID	Data
205	n a b b b b c d e

n— Number of parameter data characters = 8
a— Time point type identifier
0 = Reserved for SAE assignment
1 = Scheduled Time of Arrival
2 = Estimated Time of Arrival
3 = Actual Time of Arrival
4 = Schedule Time of Departure
5 = Estimated Time of Departure
6 = Actual Time of Departure
7-255 = Reserved
b— Time point location identifier - Represents a specific location in a transit route associated with the time stamp represented in characters c, d and e.
c— Seconds
d— Minutes
e— Hours

A.206 AGENCY IDENTIFICATION

Identifies the owning agency and/or the operating agency of a vehicle.

Parameter Data Length: Variable
Data Type: Alphanumeric
Bit Resolution: ASCII
Maximum Range: 0 to 255 (Each character)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
206	n [a a a] b [c c c]
n—	Number of parameter data characters
a—	Owning Agency identification field
b—	ASCII “*”
c—	Operating Agency identification field

NOTE: The Owning Agency and Operating Agency fields are variable in length and are separated by an ASCII “*”. It is not necessary to include both fields; however the delimiter “*” is always required.

A.207 CASHBOX INFORMATION

Used to obtain the cashbox identification and value of contents.

Parameter Data Length: 6 Characters
Data Type: Character 1-2 = Unsigned Integer
Character 3-6 = Unsigned long integer
Bit Resolution: Character 1-2 = Binary
Character 3-6 = (single local monetary unit) x 0.01 (e.g. U.S. dollar x 0.01 = 1 cent)
Maximum Range: Character 1-2 = 0 to 65535
Character 3-6 = 0 to 42949672.95 (local monetary unit)
Transmission Update Period: On request or as needed
Message Priority: 6
Format:

PID	Data
207	n a a b b b b
n—	Number of parameter data characters = 6
a—	Cashbox Identification
b—	Cashbox Revenue

A.208 TOTAL REFRIGERANT COMPRESSOR HOURS

Accumulated number of hours that the air conditioner refrigerant compressor has been engaged.

Parameter Data Length: 4 Characters
Data Type: Unsigned Long Integer
Bit Resolution: 0.05 h
Maximum Range: 0.0 to 214748364.8 h
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
208	n a a a a
n—	Number of parameter data characters = 4
a—	Total refrigerant compressor hours

A.209 ABS CONTROL STATUS, TRAILER

To be used to send trailer ABS control and warning lamp status. A tractor mounted ECU may broadcast this message and report the ABS status of all trailers at once.

Parameter Data Length: Variable
Data Type: Binary Bit-Mapped
Bit Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: 0.5 s
Message Priority: 3
Format:

PID	Data
209	n a b c
n—	Number of parameter data characters (see Note 4)
a—	ABS Control Status, Trailer Bits 8-7: ABS brake control Status, Trailer # 1 Bits 6-5: ABS warning lamp, Trailer # 1 Bits 4-3: Trailer ABS Control Status Bits 2-1: Tractor Mounted Trailer ABS Lamp
b—	ABS Control Status, Trailer Bits 8-7: ABS brake control Status, Trailer # 3 Bits 6-5: ABS warning lamp, Trailer # 3 Bits 4-3: ABS brake control Status, Trailer # 2 Bits 2-1: ABS warning lamp, Trailer # 2
c—	ABS Control Status, Trailer Bits 8-7: ABS brake control Status, Trailer # 5 Bits 6-5: ABS warning lamp, Trailer #5 Bits 4-3: ABS brake control Status, Trailer # 4 Bits 2-1: ABS warning lamp, Trailer # 4

NOTE 1: Character “a” bits 4-3 are a composite of one or more individual trailer ABS control status messages. Status will be “on” if trailer ABS control status “on” is received from any trailer.

NOTE 2: Character “a” bits 2-1 are a composite of one or more individual trailer ABS warning lamp messages. Status will be “on” if trailer ABS warning lamp 'on' is received from any trailer.

NOTE 3: Each status will be described using the following nomenclature:

00	Off/Not Active
01	On/Active
10	Error condition
11	Not available

NOTE 4: Message may include a, b or c characters dependent on vehicle configuration. e.g. Message may be MID 209 001 a or MID 209 002 a b or MID 209 003 a b c.

A.210 TIRE TEMPERATURE (BY SEQUENCE NUMBER)

Communicates the tire temperature(s) by sequence number. (Not position specific)

Parameter Data Length: Variable
Data Type: Unsigned Short Integer (each character)
Bit Resolution: 2.5 °F per bit
Maximum Range: 0.0 to 625.0 °F
Transmission Update Period: 10.0 s
Message Priority: 6
Format:

PID	Data
210	n a a a…
n—	Number of parameter data characters
a—	Tire temperature by sequence number 251-253 = Reserved for future assignment by SAE 254 = Error 255 = Not available

NOTE: See PID 242 for position specific tire temperature

A.211 TIRE PRESSURE (BY SEQUENCE NUMBER)

PID to communicate the tire pressure(s) by sequence number. (Not position specific)

Parameter Data Length: Variable
Data Type: Unsigned Short Integer (each character)
Bit Resolution: 4.14 kPa/bit (0.6 psi/bit)
Maximum Range: 0.0 to 1035 kPa (0.0 to 150.0 psi)
Transmission Update Period: 10.0 s
Message Priority: 6
Format:

PID	Data
211	n a a a…
n—	Number of parameter data characters
a—	Tire pressure by sequence number 251-253 = Reserved for future assignment by SAE 254 = Error 255 = Not available

NOTE: See PID 241 for position specific tire pressure.

A.212 TIRE PRESSURE TARGET (BY SEQUENCE NUMBER)

Communicates the tire pressure target(s) by sequence number. (Not position specific)

Parameter Data Length: Variable
Data Type: Unsigned Short Integer (each character)
Bit Resolution: 4.14 kPa/bit (0.6 psi/bit)
Maximum Range: 0.0 to 1035 kPa (0.0 to 150.0 psi)
Transmission Update Period: 10.0 s
Message Priority: 6
Format:

PID	Data
212	n a a a…
n—	Number of parameter data characters
a—	Tire pressure target by sequence number 251-253 = Reserved for future assignment by SAE 254 = Error 255 = Not available

A.213 WHEEL END ASSEMBLY VIBRATION LEVEL

Measurement of vibration level at wheel end assembly.

Parameter Data Length: 3 Characters
Data Type: Unsigned Short Integer
Bit Resolution: 1 g/bit
Maximum Range: 0 to 255 g (multiplier for the acceleration of gravity)
Transmission Update Period: 10.0 s
Message Priority: 7
Format:

PID	Data
213	n a b c
n—	Number of parameter data characters = 3
a—	Trailer or power unit MID
b—	Wheel position = (axle number x 16) + Wheel end assembly number
c—	Vibration level of the wheel end assembly

Wheel end assembly numbers on the axle are assigned as follows:

Left wheel end assembly = 1
Right wheel end assembly = 4

NOTE: PID has to be broadcast as many times as necessary to transmit all available information.

A.214 VEHICLE WHEEL SPEEDS

Indicated velocity of the individual wheels.

Parameter Data Length: 6 Characters
Data Type: Unsigned Short Integer
Bit Resolution: 0.805 km/h (0.5 mph)/bit
Maximum Range: 0.0 to 205.2 km/h (0.00 to 127.5 mph)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
214	n a b c d e f
n—	Number of parameter data characters
a—	Wheel speed ABS axle 1 Left
b—	Wheel speed ABS axle 1 Right
c—	Wheel speed ABS axle 2 Left
d—	Wheel speed ABS axle 2 Right
e—	Wheel speed ABS axle 3 Left
f—	Wheel speed ABS axle 3 Right

A.215 BRAKE TEMPERATURE

Temperature of the brake shoe/brake pad/brake drum.

Parameter Data Length: 3 Characters
Data Type: Character 1-2 = Unsigned Short Integer
Character 3 = Signed Short Integer
Bit Resolution: Character 1-2 = Binary
Character 3 = 5 °F/bit
Maximum Range: 0 °F to 1275.0 °F
Transmission Update Period: 10.0 s
Message Priority: 6
Format:

PID	Data
215	n a b c
n—	Number of parameter data characters = 3
a—	Trailer or power unit MID
b—	Wheel position = (axle number x 16) + brake number
c—-	Brake temperature

Brake numbers on the axle are assigned as follows:

Outer left brake = 1
Inner left brake = 2
Inner right brake = 3
Outer right brake = 4

A.216 WHEEL BEARING TEMPERATURE

Measurement of bearing temperature at axle end.

Parameter Data Length: 3 Characters
Data Type: Character 1-2 = Unsigned Short Integer
Character 3 = Signed Short Integer
Bit Resolution: Character 1-2 = Binary
Character 3 = 1.2 °F/bit
Maximum Range: 0 °F to 306.0 °F
Transmission Update Period: 10.0 s
Message Priority: 6
Format:

PID	Data
216	n a b c

n— Number of parameter data characters = 3
a— Trailer or power unit MID
b— Wheel position = (axle number x 16) + bearing number
c— Bearing temperature

Bearing numbers on the axle are assigned as follows:

Outer left wheel bearings = 1
Inner left wheel bearings = 2
Inner right wheel bearings = 3
Outer right wheel bearings = 4

A.217 FUEL TANK/NOZZLE IDENTIFICATION

Used to identify the fuel tank and fuel nozzle during fueling.

Parameter Data Length: 11 Characters
Data Type: Character 1-2 = Unsigned Short Integer
Character 3-11 = Alphanumeric
Bit Resolution: Character 1-2 = Binary
Character 3-11 = ASCII
Maximum Range: 0 to 255 (each character)
Transmission Update Period: On request or at introduction/extraction of nozzle into the fuel tank. Not continuously broadcasted while nozzle is inserted.
Message Priority: 8
Format:

PID	Data
217	n a b b b b b b b b b b

n— Number of parameter data characters = 11
a— Tank identification/Antenna status
Bits 4-1: Tank Identification
0000 = tank 1
through
1111 = tank 16
Bits 6-5: Reserved-all bits set to 1
Bits 8-7: Tank antenna status
00 = Not active
01 = Active
10 = Error condition
11 = Not available
b—Nozzle identification (10 ASCII)

A.218 STATE LINE CROSSING

Used to report when a vehicle crosses, or last crossed, a state line.

Parameter Data Length: Variable
Data Type: Characters 1-5—Unsigned short integer
Characters 6-17—Alpha
Resolution: Character 1 = 0.25 day/bit
Character 2 = 1 month/bit
Character 3 = 1 year/bit
Character 4 = 1 min/bit
Character 5 = 1 h/bit
Character 6-17 = ASCII
Maximum Range: Character 1 = 0 to 63.75 day
Character 2 = 0 to 255 month
Character 3 = 0 to 255 year
Character 4 = 0 to 255 min
Character 5 = 0 to 255 h
Character 6-17 = 0 to 255 (each character)
Valid Range: Character 1 = 0.25 to 31.75 day
Character 2 = 1 to 12 month
Character 3 = 0 to 255 year
Character 4 = 0 to 59 min
Character 5 = 0 to 23 h
Character 6-17 = 0 to 255 (each character)
Transmission Update Period: On change or on request
Message Priority: 8
Format:

PID	Data
218	n a b c d e f f f g g g h h h j j j
n—	Number of parameter data characters = 17
a—	Day
b—	Month
c—	(Year - 1985)
d—	Minutes
e—	Hours
f—	Old State abbreviation
g—	Old Country abbreviation
h—	New State abbreviation
j—	New Country abbreviation

A value of 0 for the date (Character 1) 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.

A value of 0 for the month (Character 2) is null. The value 1 identifies January; 2 identifies February, etc.

A value of 0 for the year (Character 3) identifies the year 1985, a value of 1 identifies 1986, etc.

NOTE: It is recommended that spaces (ASCII 32) are used at the end of each abbreviation to fill each field out to three characters, as required. State abbreviations will conform to the United States Postal Publication 65 and Country abbreviations will conform to ISO 3166.

A.219 CURRENT STATE

Used to report the current country and state.

Parameter Data Length: Variable
Data Type: Alpha
Resolution: ASCII
Maximum Range: 0 to 255 (each character)
Transmission Update Period: 10.0 s
Message Priority: 7
Format:

PID	Data
219	n a a a b b b
n—	Number of parameter data characters = 6
a—	Current State abbreviation
b—	Current Country abbreviation

NOTE: It is recommended that spaces (ASCII 32) are used at the end of each abbreviation to fill each field out to three characters, as required. State abbreviations will conform to the United States Postal Publication 65 and Country abbreviations will conform to ISO 3166.

A.220 ENGINE TORQUE HISTORY

Used to report the current engine torque configuration and all previous engine torque configurations available.

Parameter Data Length: Variable
Data Type: Characters 1-4—Unsigned integer
Characters 5-7—Unsigned short integer
Character 8—Unsigned long integer
Character 9—Binary bit-mapped
Characters 10-18—Unsigned integer
Bit Resolution: Character 1 = 1 record/bit
Character 2—0.5 kW/bit
Characters 3-4—1 Nm/bit
Character 5—1 month/bit
Character 6—0.25 day/bit
Character 7—1 year/bit
Character 8—0.05 hours/bit
Character 9—Binary
Character 10—0.01 ratio/bit
Character 11—1 Nm/bit
Character 12—0.01 ratio/bit
Character 13—1 Nm/bit
Characters 14—0.01 ratio/bit
Characters 15-17—1 Nm/bit
Character 18—2 Nm/bit
Valid Range: Character 1 = 0 to 255
Character 2 = 0 to 32767.5 kW
Characters 3-4 = 0 to 65535 Nm
Character 5 = 1 to 12 month
Character 6 = 0.25 to 31.75 day
Character 7 = 0 to 255 year
Character 8 = 0 to 214741811 hours
Character 9 = 0 to 255
Character 10 = 0 to 655
Character 11 = 0 to 65535 Nm
Character 12 = 0 to 655

Character 13 = 0 to 65535 Nm
Character 14 = 0 to 655
Characters 15-17 = 0 to 65535 Nm (each character)
Character 18 = 0 to 100000 Nm

Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
220	n a b b c c d d e f g h h h h j k k m m n n p p q q r r t t u u v v w w w w w w

- n— Number of parameter data characters
- a— Number of calibration records
- b— Engine power
- c— Peak engine torque 1
- d— Peak engine torque 2
- e— Calibration record start month
- f— Calibration record start day
- g— (Calibration record start year – 1985)
- h— Calibration record duration time
- j— Torque limiting feature status
  - Bits 8-6: Reserved—all bits set to 1
  - Bits 5-3: Torque limiting feature
    - 000: Not available
    - 001: Highest torque rating
    - 010: First torque rating
    - 011: Previous torque rating (rating prior to the one active)
    - 100: Current torque rating
    - 101-111: Reserved
  - Bits 2-1: Torque limiting feature status
    - 00=Feature is disabled
    - 01=Feature is enabled
    - 10=Reserved
    - 11=Not available/not applicable
- k— Transmission gear ratio 1
- m— Engine torque limit 1—Transmission
- n— Transmission gear ratio 2
- p— Engine torque limit 2—Transmission
- q— Transmission gear ratio 3
- r— Engine torque limit 3—Transmission
- t— Engine torque limit 4—Transmission
- u— Engine torque limit 5—Switch
- v— Engine torque limit 6—Axle input
- w— Reserved—for future assignment

NOTE 1: The number of calibration records (character 1) shall be set to 0 if no torque history records are stored in the ECU. Each calibration record is 38 bytes in length. If more than one calibration record exists, the records are concatenated one after the other in a single message.

NOTE 2: The engine power (character 2) shall represent the advertised power that a customer will find on a sales sheet for an engine with a certain calibration.

NOTE 3: For calibrations that support two torque curves, peak engine torque 1 (character 3) should be assigned the value of the lower curve and peak engine torque 2 (character 4) should be assigned the value of the higher curve. For calibrations that support one torque curve, peak engine torque should be used to represent this torque and peak engine torque 2 should be set to 0.

NOTE 4: The calibration record time stamp (characters 5-7) shall represent the time when an ECU record was established. A value of 0 for the year (character 7) identifies the year 1985, a value of 1 identifies 1986, etc.

NOTE 5: The calibration record duration time (character 8) shall represent the duration in hours for which the engine operated in the conditions captured in the record.

NOTE 6: The gear ratio values define a range of transmission gears for which a limit is applied to the engine output torque. Transmission gear ratio 1 (character 10) should be the numerically highest transmission gear ratio breakpoint with transmission gear ratio 2 (character 12) and transmission gear ratio 3 (character 14) representing gear ratios in descending order.

NOTE 7: Engine torque limit 1—transmission (character 11) is the limit applied to the engine output torque during vehicle operation in transmission gear ratios numerically greater than transmission gear ratio 1.

NOTE 8: Engine torque limit 2—transmission (character 13) is the limit applied to the engine output torque during vehicle operation in transmission gear ratios numerically less than or equal to transmission gear ratio 1 and numerically greater than transmission gear ratio 2. For example, if transmission gear ratio 1 is equal to 12.0:1 and transmission gear ratio 2 is equal to 5.0:1, vehicle operation in a transmission gear with a ratio of 6.0:1 will result in application of engine torque limit 2—transmission.

NOTE 9: Engine torque limit 3—transmission (character 15) is the limit applied to the engine output torque during vehicle operation in transmission gear ratios numerically less than or equal to transmission gear ratio 2 and numerically greater than transmission gear ratio 3. For example, if transmission gear ratio 2 is equal to 5.0:1 and transmission gear ratio 3 is equal to 2.0:1, vehicle operation in a transmission gear with a ratio of 3.0:1 will result in application of engine torque limit 3—transmission.

NOTE 10: Engine torque limit 4—transmission (character 16) is the limit applied to the engine output torque during vehicle operation in transmission gear ratios numerically less than or equal to transmission gear 3.

NOTE 11: Engine torque limit 5—switch (character 17) is the limit applied to the engine output torque based on activation of an ECU switch input.

NOTE 12: Engine torque limit 6—axle input (character 18) is the limit applied to the engine output torque based on the maximum allowable axle input torque. Axle input torque is calculated as current engine torque output multiplied by transmission gear ratio.

A.221 ANTI-THEFT REQUEST

See Appendix E.

A.222 ANTI-THEFT RESPONSE

See Appendix E.

A.223 AUXILIARY A/D COUNTS

Provides a mechanism to report the number of digital counts identifying one or more analog channels. Each channel is represented by 2 bytes and the number of channels reported can be determined by dividing the number of data characters (n) by 2. The definition and transfer function of each channel is manufacturer specific. All channels are broadcast upon request of this parameter. Not to be used in place of existing PIDs.

Parameter Data Length: Variable
Data Type: Unsigned Integer (each channel)
Bit Resolution: 1 count
Maximum Range: 0 to 65535 counts
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
223	n a a (b b c c ...)
n—	Number of parameter data characters
a a—	A/D counts for channel 1
b b—	A/D counts for channel 2 (optional)
c c—	A/D counts for channel 3 (optional)

A.224 IMMOBILIZER SECURITY CODE

The encrypted security code data that is communicated between the vehicle security immobilizer control unit and the engine electronic control unit, immediately after the ignition key is turned on. The correct key transponder and the correct mating of the immobilizer and engine security codes allow the engine controller to unlock the fuel control system.

Parameter Data Length: Variable
Data Type: Defined by manufacturer
Bit Resolution: Defined by manufacturer
Maximum Range: Defined by manufacturer
Transmission Update Period: 0.1 s for the first 3 s after ignition on
Message Priority: 1
Format:

PID	Data
224	n a a a a
n—	Number of parameter data characters
a a a a—	Immobilizer Security Code

A.225 TEXT MESSAGE ACKNOWLEDGED

See Appendix C.

A.226 TEXT MESSAGE TO DISPLAY

See Appendix C.

A.227 TEST MESSAGE DISPLAY TYPE

See Appendix C.

A.228 SPEED SENSOR CALIBRATION

The number of pulses per kilometer (pulses per mile) produced by the speed sensor.

Parameter Data Length: 4 Characters
Data Type: Unsigned Long Integer
Bit Resolution: 0.621 pulses per km (1 pulse per mile)
Maximum Range: 0.0 to 2667174690 ppkm (0.0 to 4294967295 ppm)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
228	n a a a a
n—	Number of parameter data characters = 4
a a a a—	Speed sensor calibration

A.229 TOTAL FUEL USED (NATURAL GAS)

Accumulated amount of fuel used during vehicle operation.

Parameter Data Length: 4 Characters
Data Type: Unsigned Long Integer
Bit Resolution: 0.5 kg (1.10 lb)
Maximum Range: 0.0 to 2147483648 kg (0.0 to 4724464025 lb)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
229	n a a a a
n—	Number of parameter data characters = 4
a a a a—	Total fuel used (natural gas)

NOTE: See PID 250 for alternate units.

A.230 TOTAL IDLE FUEL USED (NATURAL GAS)

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

Parameter Data Length: 4 Characters
Data Type: Unsigned Long Integer
Bit Resolution: 0.5 kg (1.10 lb)
Maximum Range: 0.0 to 2147483648 kg (0.0 to 4724464025 lb)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
230	n a a a a
n—	Number of parameter data characters = 4
a a a a—	Total idle fuel used (natural gas)

NOTE: See PID 236 for alternate units.

A.231 TRIP FUEL (NATURAL GAS)

Fuel consumed during all or part of a journey.

Parameter Data Length: 4 Characters
Data Type: Long Integer
Bit Resolution: 0.5 kg (1.10 lb)
Maximum Range: 0.0 to 2147483648 kg (0.0 to 4724464025 lb)
Transmission Update Period: 10.0 s
Message Priority: 7
Format:

PID	Data
231	n a a a a
n—	Number of parameter data characters = 4
a a a a—	Trip fuel (natural gas)

NOTE: See PID 182 for alternate units.

A.232 DGPS DIFFERENTIAL CORRECTION

Equivalent to an RTCM-104 Type 9 differential GPS correction message.

For more information, refer to the standards document “RTCM-104, Version 2.0, January 1990.” Note that the following field sizes, data types, bit resolutions and maximum ranges are identical to those in the RTCM-104, Version 2.0 document, and are repeated here for completeness.

Parameter Data Length: Variable
Data Type: Characters 1-2 = Binary Bit-Mapped—transmitted least significant character first
Character 3 = Binary Bit-Mapped
Characters 4-5 = Signed Integer
Character 6 = Signed Short Integer
Character 7 = Unsigned Short Integer
Bit Resolution: Characters 1-2
Reference station health = Binary
Modified Z-count = 0.6 s
Character 3 = Binary
Scale factor = Binary
User Differential Range Error (UDRE) = Binary
Satellite ID = Binary
Characters 4-5
Pseudorange correction (PRC) = 0.02 m (0.79 in) if scale factor = 0
Pseudorange correction = 0.32 m (12.60 in) if scale factor = 1
Character 6
Range-rate correction (RRC) = 0.002 m/s (0.079 in/s) if scale factor = 0
Range-rate correction = 0.032 m/s (1.260 in/s) if scale factor = 1
Character 7
Issue of data = Binary
Maximum range: Characters 1-2
Station health = 0 to 7
Modified Z-count = 0 to 4914.6 s
Character 3
Scale factor = 0 to 1
UDRE = 0 to 3
Satellite ID = 1 to 32 (satellite 32 is indicated with all zeros, 00000_2)
Characters 4-5
Pseudorange correction = –655.34 to +655.34 m (–25800.93 to +25800.93 in) if scale factor = 0
Pseudorange correction = –10485.44 to +10485.44 m (–412812.6 to +412812.6 in) if scale factor = 1

NOTE: The value 8000_{16} indicates a problem and the user equipment should immediately stop using this satellite.

Character 6
Range-rate correction = –0.254 to +0.254 m/s (–10.0 to + 10.0 in/s) if scale factor = 0
Range-rate correction = –4.064 to +4.064 m/s (–160.0 to +160.0 in/s) if scale factor = 1

NOTE: The value 80_{16} indicates a problem and the user equipment should immediately stop using this satellite.

Character 7 = 0 to 255
Transmission Update Period: 5.0 to 30.0 s (depends on position accuracy required)
Message Priority: 7

Format:

PID	Data
232	n a a b c c d e

n— Number of parameter data characters = 7
a— Modified Z-count/Station health
Bits 16-14: Station health
Bits 13-1: Modified Z-count
b— Scale factor/UDRE/Satellite ID
Bit 8: Scale factor
Bits 7-6: UDRE
Bits 5-1: Satellite ID
c— Pseudorange correction
d— Range-rate correction
e— Issue of data

A.233 UNIT NUMBER (POWER UNIT)

Owner assigned unit number for power unit of a combination vehicle, straight truck, or transit vehicle.

Parameter Data Length: Variable
Data Type: Alphanumeric
Bit Resolution: ASCII
Maximum Range: 0 to 255 (each character)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
233	n a a a ...

n— Number of parameter data characters
a— Unit number

A.234 SOFTWARE IDENTIFICATION

Software identification of an electronic module.

Parameter Data Length: Variable
Data Type: Alphanumeric
Bit Resolution: ASCII
Maximum Range: 0 to 255 (each character)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
234	n a a a [b c c c ...]
n—	Number of parameter data characters
a—	Software identification field
b—	Optional delimiter: ASCII “*”
c—	Optional additional software identification field

The software identification field is variable in length and may contain more than one software identification designator. An ASCII “*” is used as a delimiter to separate multiple software identifications when required. If only one software identification field is contained in the parameter, the delimiter is not required. Additional software identification fields may be added at the end, each separated by an ASCII “*” as a delimiter. If the software identification for a particular product exceeds 18 bytes then PID 192 shall be used to section this parameter.

A.235 TOTAL IDLE HOURS

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

Parameter Data Length: 4 Characters
Data Type: Unsigned Long Integer
Bit Resolution: 0.05 h
Maximum Range: 0.0 to 214748364.8 h
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
235	n a a a a
n—	Number of parameter data characters = 4
a a a a—	Total idle hours

A.236 TOTAL IDLE FUEL USED

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

Parameter Data Length: 4 Characters
Data Type: Unsigned Long Integer
Bit Resolution: 0.473 L (0.125 gal)
Maximum Range: 0.0 to 2032277476 L (0.0 to 536870911.9 gal)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
236	n a a a a
n—	Number of parameter data characters = 4
a a a a—	Total idle fuel used

NOTE: See PID 230 for alternate units.

A.237 VEHICLE IDENTIFICATION NUMBER

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

Parameter Data Length: Variable
Data Type: Alphanumeric
Resolution: ASCII
Maximum Range: 0 to 255 (each character)
Transmission: On request
Message Priority: 8
Format:

PID	Data
237	n a a a ...
n—	Number of parameter data characters
a—	VIN

A.238 VELOCITY VECTOR

Any combination of the velocity, heading, and pitch, as calculated by the navigation device(s).

Parameter Data Length: 5 Characters
Data Type: Character 1 = Unsigned Short Integer
Characters 2-3 = Unsigned Integer
Characters 4-5 = Signed Integer
Bit Resolution: Character 1 = 0.805 km/h (0.5 mph)
Characters 2-3 = 0.01 degree/bit
Characters 4-5 = 0.01 degree/bit
Maximum Range: Character 1 = –24 to +180.2 km/h (–15 to +112.0 mph)
(range is offset to acknowledge backward motion)
181.1 km/h (112.5 mph) indicates “Data Not Available”
Characters 2-3 = 0 to 655.34 degree
655.35 degree indicates “Data Not Available”
Characters 4-5 = –327.67 to +327.67 degree
–327.68 degree indicates “Data Not Available”
Transmission Update Period: On request
Message Priority: 6
Format:

PID	Data
238	n a b b c c
n—	Number of parameter data characters
a—	Calculated vehicle speed
b—	Present vehicle heading
c—	Pitch, positive = ASCENT, negative = DESCENT

A.239 POSITION

The three-dimensional location of the vehicle.

Parameter Data Length: 10 Characters
Data Type: Characters 1-4 = Signed Long Integer
Characters 5-8 = Signed Long Integer
Characters 9-10 = Signed Integer
Resolution: Characters 1-4 = (10-6) degree/bit
Characters 5-8 = (10-6) degree/bit
Characters 9-10 = 0.15 m/bit (0.5 ft/bit)
Maximum Range: Characters 1-4 = –2147.483648 to +2147.483647 degree
Characters 5-8 = –2147.483648 to +2147.483647 degree
Characters 9-10 = –2497 to 4993.7 m (16384 to +16383.5 ft)
Transmission Update Period: On request
Message Priority: 6
Format:

PID	Data
239	n a a a a b b b b c c

n— Number of parameter data characters
8 = latitude and longitude only (a a a a b b b b)
2 = altitude only (c c)
10 = latitude, longitude, and altitude
a— Latitude, positive = NORTH, negative = SOUTH
b— Longitude, positive = EAST, negative = WEST
c— Altitude referenced to sea level at standard atmospheric pressure and temperature

A.240 CHANGE REFERENCE NUMBER

Used to indicate that a change has occurred in the calibration data.

Parameter Data Length: Variable
Data Type: Defined by manufacturer
Resolution: Defined by manufacturer
Maximum Range: Defined by manufacturer
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
240	n a a a ...

n— Number of parameter data characters
a— Change reference number

A.241 TIRE PRESSURE BY POSITION

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

Parameter Data Length: 3 Characters
Data Type: Character 1 = Unsigned Short Integer
Character 2 = Unsigned Short Integer
Character 3 = Unsigned Short Integer
Resolution: Character 1 = Binary
Character 2 = Binary
Character 3 = 4.14 kPa/bit (0.6 lbf/in^2/bit)
Maximum Range: 0.0 to 1055 kPa (0.0 to 153.0 lbf/in^2)
Transmission Update Period: 10.0s
Message Priority: 6
Format:

PID	Data
241	n a b c
n—	Number of parameter data characters = 3
a—	Trailer or power unit MID
b—	Tire position = (axle number x 16) + wheel number
c—	Tire pressure

Axle number is incremented from front to back with the front most axle being number 1. Wheel numbers on the axle are assigned as follows:

Outer left tire = 1
Inner left tire = 2
Inner right tire = 3
Outer right tire = 4

The outer numbers are used when only one tire is on either side of an axle.

A.242 TIRE TEMPERATURE BY POSITION

Temperature at the surface of the tire sidewall.

Parameter Data Length: 3 Characters
Data Type: Character 1 = Unsigned Short Integer
Character 2 = Unsigned Short Integer
Character 3 = Unsigned Short Integer
Resolution: Character 1 = Binary
Character 2 = Binary
Character 3 = 2.5 °F/bit
Maximum Range: 0.0 to 637.5 °F
Transmission Update Period: 10.0s
Message Priority: 6
Format:

PID	Data
242	n a b c

n— Number of parameter data characters = 3
a— Trailer of power unit MID
b— Tire position = (axle number x 16) + wheel number
c— Tire temperature

Axle number is incremented from front to back with the front most axle being number 1. Wheel numbers on the axle are assigned as follows:

Outer left tire = 1
Inner left tire = 2
Inner right tire = 3
Outer right tire = 4

The outer numbers are used when only one tire is on either side of an axle.

A.243 COMPONENT IDENTIFICATION PARAMETER

Used to identify the Make, Model, and Serial Number of any component on the vehicle.

Parameter Data Length: Variable
Data Type: Alphanumeric
Resolution: ASCII
Maximum Range: 0 to 255 (each character)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
243	n b c c c c c * d d d d d d d d d * e e e e e e e e e e

n— Number of parameter data characters
b— MID of component being identified
c— Characters specifying component Make
d— Characters specifying component Model
e— Characters specifying component Serial Number

When used, the Make is five characters long and shall correspond to the codes defined in the American Trucking Association Vehicle Maintenance Reporting Standard (ATA/VMRS). It is suggested that spaces (ASCII 32) are used to fill the remaining characters if the ATA/VMRS make code is less than five characters in length. The model and Serial Number fields are variable in length and separated by an ASCII “*”. It is not necessary to include all three fields; however, the delimiter (“*”) is always required.

A.244 TRIP DISTANCE

Distance traveled during all or part of a journey.

Parameter Data Length: 4 Characters
Data Type: Unsigned Long Integer
Bit Resolution: 0.16 km (0.1 mi)
Maximum Range: 0.0 to 691207984.6 km (0.0 to 429496729.5 mi)
Transmission Update Period: 10.0 s
Message Priority: 7
Format:

PID	Data
244	n a a a a
n—	Number of parameter data characters = 4
a a a a—	Trip distance

A.245 TOTAL VEHICLE DISTANCE

Accumulated distance travelled by vehicle during its operation.

Parameter Data Length: 4 Characters
Data Type: Unsigned Long Integer
Bit Resolution: 0.161 km (0.1 mi)
Maximum Range: 0.0 to 691207984.6 km (0.0 to 429496729.5 mi)
Transmission Update Period: 10.0 s
Message Priority: 7
Format:

PID	Data
245	n a a a a
n—	Number of parameter data characters = 4
a a a a—	Total vehicle distance

A.246 TOTAL VEHICLE HOURS

Accumulated time of operation of vehicle.

Parameter Data Length: 4 Characters
Data Type: Unsigned Long Integer
Bit Resolution: 0.05 h
Maximum Range: 0.0 to 214748364.8 h
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
246	n a a a a
n—	Number of parameter data characters = 4
a a a a—	Total vehicle hours

A.247 TOTAL ENGINE HOURS

Accumulated time of operation of engine.

Parameter Data Length: 4 Characters
Data Type: Unsigned Long Integer
Bit Resolution: 0.05 h
Maximum Range: 0.0 to 214748364.8 h
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
247	n a a a a
n—	Number of parameter data characters = 4
a a a a—	Total engine hours

A.248 TOTAL PTO HOURS

Accumulated time of operation of power takeoff device.

Parameter Data Length: 4 Characters
Data Type: Unsigned Long Integer
Bit Resolution: 0.05 h
Maximum Range: 0.0 to 214748364.8 h
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
248	n a a a a
n—	Number of parameter data characters = 4
a a a a—	Total PTO hours

A.249 TOTAL ENGINE REVOLUTIONS

Accumulated number of revolutions of engine crankshaft during its operation.

Parameter Data Length: 4 Characters
Data Type: Unsigned Long Integer
Bit Resolution: 1000 r
Maximum Range: 0 to 4294967295000 r
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
249	n a a a a
n—	Number of parameter data characters = 4
a a a a—	Total engine revolutions

A.250 TOTAL FUEL USED

Accumulated amount of fuel used during vehicle operation.

Parameter Data Length: 4 Characters
Data Type: Unsigned Long Integer
Bit Resolution: 0.473 L (0.125 gal)
Maximum Range: 0.0 to 2032277476 L (0.0 to 536870911.9 gal)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
250	n a a a a
n—	Number of parameter data characters = 4
a a a a—	Total fuel used

NOTE: See PID 229 for alternate units.

A.251 CLOCK

Parameter Data Length: 3 Characters
Data Type: Each Character—Unsigned Short Integer
Resolution: Character 1 = 0.25 s/bit
Character 2 = 1 min/bit
Character 3 = 1 h/bit
Maximum Range: Character 1 = 0 to 63.75 s
Character 2 = 0 to 255 min
Character 3 = 0 to 255 h
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
251	n a b c
n—	Number of parameter data characters = 3
a—	Seconds
b—	Minutes
c—	Hours

A.252 DATE

Parameter Data Length: 3 Characters
Data Type: Each Character—Unsigned Short Integer
Resolution: Character 1 = 0.25 day/bit
Character 2 = 1 month/bit
Character 3 = 1 year/bit
Maximum Range: Character 1 = 0 to 63.75 day
Character 2 = 0 to 255 month
Character 3 = 0 to 255 year
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
252	n a b c
n—	Number of parameter data characters = 3
a—	Day
b—	Month
c—	(Year—1985)

A value of 0 for the date (Character 1) 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.

A value of 0 for the month (Character 2) is null. The value 1 identifies January; 2 identifies February, etc.

A value of 0 for the year (Character 3) identifies the year 1985, a value of 1 identifies 1986, etc.

A.253 ELAPSED TIME

Parameter Data Length: Variable
Data Type: Each Character—Unsigned Short Integer
Resolution: Character 1 = 0.25 s/bit
Character 2 = 1 min/bit
Character 3 = 1 h/bit
Character 4 = 1 day/bit
Maximum Range: Character 1 = 0 to 63.75 s
Character 2 = 0 to 255 min
Character 3 = 0 to 255 h
Character 4 = 0 to 255 day
Transmission Update Period: 10.0 s
Message Priority: 7
Format:

PID	Data
253	n a b c d
n—	Number of parameter data characters
a—	Seconds
b—	Minutes
c—	Hours
d—	Days

This parameter can be shortened by dropping days, days and hours, or days, hours, and minutes.

A.254 DATA LINK ESCAPE

This PID allows transmission of information on the data bus in a nonstandard (per the protocol outlined in SAE J1587) but specific electronic module vendor's proprietary fashion. The intent of this PID is to allow a means to use the data bus for vendor specific transmissions that do not benefit the general purpose nature of the communication data link.

Parameter Data Length: Variable
Data Type: Variable
Resolution: Variable
Maximum Range: Variable
Transmission Rate: Variable up to 10 times per second
Message Priority: Parameter specific
Format:

PID	Data
254	a b
a—	Receiving module’s MID
b—	Data

A.255 EXTENSION

This PID is required to immediately follow the MID for the message. The character after this PID is a PID from page 2 (PIDs 256 to 511). All other PIDs in the message are also from page 2.

Parameter Data Length: No data bytes
Data Type: Not applicable
Resolution: Not applicable
Maximum Range: Not applicable
Transmission Rate: Not applicable
Message Priority: Parameter specific
Format:

PID	Data
255	No data associated with PID 255

A.256 REQUEST PARAMETER

Used to request parameter data transmission of page 2 parameters from other components on the data link.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: As needed
Message Priority: 8
Format:

PID	Data
256	a
a—	Parameter ID of the requested parameter from page 2 (transmitted modulo 256)

Any and all components measuring or calculating the specified parameter should transmit it if possible.

A.257 COLD RESTART OF SPECIFIC COMPONENT

Components with administrative authority may request the cold restart (powerup) of a selected component, usually to regain control of an errant component.

NOTE: The component identified by the MID in byte (a) shall perform a cold restart function upon receipt of this command. The component shall acknowledge this action by responding with PID 259 (Component Restart Response).

The issuance of this command is restricted to units which have supervisory control over system devices.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: As needed
Message Priority: 3
Format:

PID	Data
257	a
a—	MID of component requested for cold restart

A.258 WARM RESTART OF SPECIFIC COMPONENT

Components with administrative authority may request the warm restart of a selected component, usually to regain control of an errant component.

NOTE: The component identified by the MID in character a shall perform a warm restart function upon receipt of this command. The component shall acknowledge this action by responding with PID 259 (Component Restart Response).

The issuance of this command is restricted to units which have supervisory control over system devices.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: As needed
Message Priority: 3
Format:

PID	Data
258	a
a—	MID of component requested for warm restart

A.259 COMPONENT RESTART RESPONSE

Used to acknowledge the warm or cold restart as requested by a component with administrative authority using PID 257 or 258.

NOTE: Components which have become reset due to a loss of power and are returning to service should also acknowledge this action with this PID to notify the Transit Administrator of their resumed service status.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Resolution: Binary Bit-mapped
Maximum Range: 0 to 255
Transmission Update Period: As needed
Message Priority: 3
Format:

PID	Data
259	a
a—	Restart status Bits 8-7: Reserved—both bits set to 1 Bits 6-5: Return to service completed Bits 4-3: Warm restart completed Bits 2-1: Cold restart completed

NOTE: Each status will be described using the following nomenclature:

00	No/Not applicable
01	Yes
10	Error condition
11	Not available

A.260 RESERVED

To be assigned.

A.261 RESERVED

To be assigned.

A.262 RESERVED

To be assigned.

A.263 RESERVED

To be assigned.

A.264 RESERVED

To be assigned.

A.265 RESERVED

To be assigned.

A.266 RESERVED

To be assigned.

A.267 RESERVED

To be assigned.

A.268 RESERVED

To be assigned.

A.269 RESERVED

To be assigned.

A.270 RESERVED

To be assigned.

A.271 RESERVED

To be assigned.

A.272 RESERVED

To be assigned.

A.273 RESERVED

To be assigned.

A.274 RESERVED

To be assigned.

A.275 RESERVED

To be assigned.

A.276 RESERVED

To be assigned.

A.277 RESERVED

To be assigned.

A.278 RESERVED

To be assigned.

A.279 RESERVED

To be assigned.

A.280 RESERVED

To be assigned.

A.281 RESERVED

To be assigned.

A.282 RESERVED

To be assigned.

A.283 RESERVED

To be assigned.

A.284 RESERVED

To be assigned.

A.285 RESERVED

To be assigned.

A.286 RESERVED

To be assigned.

A.287 RESERVED

To be assigned.

A.288 RESERVED

To be assigned.

A.289 RESERVED

To be assigned.

A.290 RESERVED

To be assigned.

A.291 RESERVED

To be assigned.

A.292 RESERVED

To be assigned.

A.293 RESERVED

To be assigned.

A.294 RESERVED

To be assigned.

A.295 RESERVED

To be assigned.

A.296 RESERVED

To be assigned.

A.297 RESERVED

To be assigned.

A.298 RESERVED

To be assigned.

A.299 RESERVED

To be assigned.

A.300 RESERVED

To be assigned.

A.301 RESERVED

To be assigned.

A.302 RESERVED

To be assigned.

A.303 RESERVED

To be assigned.

A.304 RESERVED

To be assigned.

A.305 RESERVED

To be assigned.

A.306 RESERVED

To be assigned.

A.307 RESERVED

To be assigned.

A.308 RESERVED

To be assigned.

A.309 RESERVED

To be assigned.

A.310 RESERVED

To be assigned.

A.311 RESERVED

To be assigned.

A.312 RESERVED

To be assigned.

A.313 RESERVED

To be assigned.

A.314 RESERVED

To be assigned.

A.315 RESERVED

To be assigned.

A.316 RESERVED

To be assigned.

A.317 RESERVED

To be assigned.

A.318 RESERVED

To be assigned.

A.319 RESERVED

To be assigned.

A.320 RESERVED

To be assigned.

A.321 RESERVED

To be assigned.

A.322 RESERVED

To be assigned.

A.323 RESERVED

To be assigned.

A.324 RESERVED

To be assigned.

A.325 RESERVED

To be assigned.

A.326 RESERVED

To be assigned.

A.327 RESERVED

To be assigned.

A.328 RESERVED

To be assigned.

A.329 RESERVED

To be assigned.

A.330 RESERVED

To be assigned.

A.331 RESERVED

To be assigned.

A.332 RESERVED

To be assigned.

A.333 RESERVED

To be assigned.

A.334 RESERVED

To be assigned.

A.335 RESERVED

To be assigned.

A.336 RESERVED

To be assigned.

A.337 RESERVED

To be assigned.

A.338 RESERVED

To be assigned.

A.339 RESERVED

To be assigned.

A.340 RESERVED

To be assigned.

A.341 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

Parameter Data Length: 1 Character
Data Type: Binary Bit-mapped
Bit Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: 1.0 s or on state change
Message Priority: 3
Format:

PID	Data
341	a
a—	Override Switch Status Bits 8-3 = Reserved — all bits set to 1 Bits 2-1 = Engine Shutdown Override Switch Status

NOTE: Each status will be described using the following nomenclature:

00	Off
01	On
10	Error condition
11	Not available

A.342 TRANSPORTATION SEGMENT IDENTIFIER

Identifies the transportation segment of the device MID. Requested by diagnostic tools to determine the transportation segment of the MID of the responding ECU.

Parameter Data Length: 1 Character
Data Type: Binary Bit-mapped
Bit Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: On Request
Message Priority: 8
Format:

PID	Data
342	a
a—	Transportation Segment Identifier 0 = Basic Heavy Duty 1 = Mass Transit Specific 2 = Marine Specific 3-255 = Reserved

NOTE 1: Refer to table 1 for MID definitions and transportation segment assignments.

NOTE 2: Legacy devices (prior to June, 2004) may not respond to this message. Refer to legacy MID ID assignment list table 1, located in Appendix G.

A.343 COOLANT PUMP DIFFERENTIAL PRESSURE

The differential pressure measured across the input and output of the engine coolant pump.

Parameter Data Length: 1 Character
Data Type: Signed Short Integer
Bit Resolution: 3.25 kPa / bit
Maximum Range: -416 kPa to 412.75 kPa
Transmission Update Period: 1.0 s
Message Priority: 6
Format:

PID	Data
343	a
a—	Coolant Pump Differential Pressure

A.344 DRIVER LOGON STATUS

Indicates the result of any off-board process that validates the driver logon information in response to a change in Driver Identification (PID 507) and/or the Transit Route Identification (PID 508) being associated with this Driver ID.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Bit Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: On change
Message Priority: 8
Format:

PID	Data
344	a
a—	Driver login status 0 = Driver logon valid 1-255 = Driver logon invalid (Reasons defined by manufacturer application document)

A.345 SUSPENSION CONTROL STATUS #1

Indicates the status of the suspension control system.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Bit Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
345	a
a—	Suspension control status #1 Bits 8-7: Traction help switch status (Active suspension help switch status) Bits 6-5: Failure warning lamp status (Suspension ECU failure) Bits 4-3: Warning level lamp status (Out of normal ride height mode) Bits 2-1: Traction help lamp status (Active suspension help lamp status)

NOTE 1: “Out of normal ride height mode” means being in loading, off-road, low ride or kneel mode.

NOTE 2: Each status will be described using the following nomenclature:

00	Off/Not Active
01	On/Active
10	Error condition
11	Not available

A.346 SUSPENSION CONTROL STATUS #2

Indicates the status of the suspension control system.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Bit Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
346	a
a—	Suspension control status #2 Bits 8-7: Low level status Bits 6-5: High level status Bits 4-3: Kneel level status Bits 2-1: Lift Axle Status

NOTE: Each status will be described using the following nomenclature:

00	Off/Not Active/Lift Axle Down
01	On/Active/Lift Axle Up
10	Error condition
11	Not available

NOTE: See PID 9 for additional lift axle parameters.

A.347 FAREBOX PROBE TYPE

Used to obtain the farebox probe type.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Bit Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
347	a
a—	Data Probe Type 0 = Driver Stationary probe with data collection unit logon valid 1 = Portable probe with data collection unit 2 = Portable probe without data collection unit 3-255 = Undefined

A.348 CARGO REFRIGERATION SYSTEM OPERATING MODE, ZONE #1

Refrigerated cargo controller's operating mode for zone #1 in a trailer.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: 10.0 s
Message Priority: 8
Format:

PID	Data
348	a
a—	Operating mode for zone #1 Bits 8-4: Reserved – all bits set to 1 Bits 3-1: Operating Mode 000 - Power Off or Unknown 001 - Cooling 010 - Heating 011 - Defrost 100 - Null 101 - Pre-trip 110 - Defined by manufacturer application document 111 - Defined by manufacturer application document

NOTE: See PIDs 349 and 350 for additional cargo refrigeration system operation mode zone parameters. If only one trailer refrigeration zone exists, PID 348 should be used.

A.349 CARGO REFRIGERATION SYSTEM OPERATING MODE, ZONE #2

Refrigerated cargo controller's operating mode for zone #2 in a trailer.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: 10.0 s
Message Priority: 8
Format:

PID	Data
349	a
a—	Operating mode for zone #2 Bits 8-4: Reserved – all bits set to 1 Bits 3-1: Operating Mode 000 - Power Off or Unknown 001 - Cooling 010 - Heating 011 - Defrost 100 - Null 101 - Pre-trip 110 - Defined by manufacturer application document 111 - Defined by manufacturer application document

NOTE: See PIDs 348 and 350 for additional cargo refrigeration system operation mode zone parameters. If only one trailer refrigeration zone exists, PID 348 should be used.

A.350 CARGO REFRIGERATION SYSTEM OPERATING MODE, ZONE #3

Refrigerated cargo controller's operating mode for zone #3 in a trailer.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: 10.0 s
Message Priority: 8
Format:

PID	Data
350	a
a—	Operating mode for zone #3 Bits 8-4: Reserved – all bits set to 1 Bits 3-1: Operating Mode 000 - Power Off or Unknown 001 - Cooling 010 - Heating 011 - Defrost 100 - Null 101 - Pre-trip 110 - Defined by manufacturer application document 111 - Defined by manufacturer application document

NOTE: See PIDs 348 and 349 for additional cargo refrigeration system operation mode zone parameters. If only one trailer refrigeration zone exists, PID 348 should be used.

A.351 TURBOCHARGER COMPRESSOR INLET TEMPERATURE

Temperature of the air entering the turbocharger compressor inlet.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 1 °F
Maximum Range: 0 to 255 °F
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
351	a
a—	Turbocharger compressor inlet temperature

A.352 TURBOCHARGER #2 SPEED

Rotational velocity of rotor in turbocharger #2.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 500 rpm
Maximum Range: 0 to 127500 rpm
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
352	a
a—	Turbocharger Speed

A.353 FUEL LEAKAGE STATUS

Status signal which indicates fuel leakage in the fuel rail of the engine. The location can be either before or after the fuel pump.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Bit Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
353	a
a—	Fuel leakage status Bits 8-5: Reserved—all bits set to 1 Bits 4-3: Fuel leakage 2 status Bits 2-1: Fuel leakage 1 status

NOTE: Each status will be described using the following nomenclature:

00	Off/No fuel leak
01	On/Fuel leak
10	Error condition
11	Not available

A.354 RELATIVE HUMIDITY

Percent relative humidity of the engine inlet air.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.4%
Maximum Range: 0.0 to 102.0%
Transmission Update Period: 10.0 s
Message Priority: 7
Format:

PID	Data
354	a
a—	Relative humidity

A.355 ENGINE OIL LIFE

Ratio of current service life remaining to maximum recommended service life. (100% = fresh oil).

A two detection device will use 0% and 100% respectively. A variable detection device will use 0% to 100%.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.4%
Maximum Range: 0.0 to 102.0%
Transmission Update Period: On request
Message Priority: 7
Format:

PID	Data
355	a
a—	Engine oil life

A.356 FIFTH WHEEL COUPLING STATUS

Status of fifth wheel couple to trailer.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Bit Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: On change
Message Priority: 4
Format:

PID	Data
356	a

a— Fifth Wheel Coupling Status
Bits 8: Reset of monitor detected
Bits 7-5: Coupling attempt counter (1-7)
Bits 4-1: Error/ Status codes
0000 – general coupling failure 1st attempt
0001 – lock closed but kingpin not detected on start up
0010 – kingpin detected but lock not detected on start up
0011 – reserved
0100 – reserved
0101 – lock detected without kingpin, two or more attempts at coupling
0110 – kingpin detected then lost, two or more attempts at coupling
0111 – kingpin detected, locks not closed or not closed quickly enough
1000 – loss of kingpin for more than 5.0 s after proper couple
1001 – loss of lock after proper couple
1010 – reserved
1011 – reserved
1100 – reserved
1101 – ECU Reset detected, (loss of power). Couple is proper but was NOT proper prior to reset.
1110 – ready to couple
1111 – proper couple

A.357 RIDE ADJUSTMENT PRESSURE

Gage pressure of air within the auxiliary load air spring. Pressure setting can be used to adjust load carrying and handling characteristics.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 4.14 kPa (0.6 lbf/in²)
Maximum Range: 0.0 to 1055 kPa (0.0 to 153.0 lbf/in²)
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
357	a

a— Ride Adjustment Pressure

A.358 AIR SUSPENSION #2 PRESSURE

The pressure of the air contained in the suspension #2 air bags.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 4.14 kPa (0.6 lbf/in²)
Maximum Range: 0.0 to 1055 kPa (0.0 to 153.0 lbf/in²)
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
358	a
a—	Air suspension #2 pressure

A.359 AIR SUSPENSION #1 PRESSURE

The pressure of the air contained in the suspension #1 air bags.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 4.14 kPa (0.6 lbf/in²)
Maximum Range: 0.0 to 1055 kPa (0.0 to 153.0 lbf/in²)
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
359	a
a—	Air suspension #1 pressure

A.360 AXLE #4 LIFT AIR PRESSURE

Gage Pressure of air in a system that utilizes compressed air to provide force between a lift axle and frame for purposes of lifting or lowering the axle.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 4.14 kPa (0.6 lbf/in²)
Maximum Range: 0.0 to 1055 kPa (0.0 to 153.0 lbf/in²)
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
360	a
a—	Axle #4 lift air pressure

A.361 AXLE #3 LIFT AIR PRESSURE

Gage Pressure of air in a system that utilizes compressed air to provide force between a lift axle and frame for purposes of lifting or lowering the axle.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 4.14 kPa (0.6 lbf/in²)
Maximum Range: 0.0 to 1055 kPa (0.0 to 153.0 lbf/in²)
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
361	a
a—	Axle #3 lift air pressure

A.362 PERCENT EXHAUST GAS RECIRCULATION VALVE #2 POSITION

Ratio of current exhaust gas recirculation (EGR) valve #2 position to the maximum EGR valve position. A value of 0% means no EGR.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.5%
Maximum Range: 0.0 to 127.5%
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
362	a
a—	Percent Exhaust Gas Recirculation Valve #2 Position

A.363 HYDRAULIC RETARDER CONTROL AIR PRESSURE

The air pressure used to control the oil pressure of the hydraulic retarder.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 4.14 kPa (0.6 lbf/in²)
Maximum Range: 0.0 to 1055 kPa (0.0 to 153.0 lbf/in²)
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
363	a
a—	Hydraulic Retarder Control Air Pressure

A.364 HVAC UNIT DISCHARGE TEMPERATURE

Temperature of air on the discharge side of the mix door.

Parameter Data Length: 1 Character
Data Type: Signed Short Integer
Bit Resolution: 2.5 °F
Maximum Range: –320.0 to +317.5 °F
Transmission Update Period: On request
Message Priority: 7
Format:

PID	Data
364	a
a—	HVAC unit discharge temperature

A.365 WEIGHING SYSTEM STATUS COMMAND

Communicates the current zeroing status of the vehicle weighing system.

Parameter Data Length: 1 Character
Data Type: Binary bit-mapped
Bit Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
365	a
a—	Weighing System Status Bits 8-5: Reserved-all bits set to 1 Bits 4-3: 00 = No change to fifth wheel 01 = fifth wheel will be off its calibration point 10 = fifth wheel is on its calibration point 11 = Not available / not applicable Bits 2-1: 00 = No change to Net Vehicle Weight Change 01 = Zero Net Vehicle Weight Change command 10 = Reserved 11 = Don’t care / Take no action

A.366 ENGINE OIL LEVEL HIGH/LOW

Amount of current volume of engine sump oil compared to recommended volume.

Parameter Data Length: 1 Character
Data Type: Signed Short Integer
Bit Resolution: 0.473 L (1.0 pt)
Maximum Range: –60.6 to 60.1 L (–128 to +127 pt)
Transmission Update Period: 10.0 s
Message Priority: 6
Format:

PID	Data
366	a
a—	Engine oil level high/low

NOTE: Amount of current volume of engine sump oil compared to recommended volume where a negative number represents the volume below the recommended level and positive numbers represent the volume above the recommended oil level.

A.367 LANE TRACKING SYSTEM STATUS

Indicates the current status of the lane tracking system.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Bit Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: 0.5 s
Message Priority: 6
Format:

PID 367
a— Lane tracking system status
Bits 8-7: Lane Tracking System Status Left Side
00 = Not Tracking
01 = Tracking
10 = Error Condition
11 = Not available
Bits 6-5: Lane Tracking System Status Right Side
00 = Not Tracking
01 = Tracking
10 = Error Condition
11 = Not available:
Bits 4-3: Lane Tracking System Status
00 = Disabled
01 = Enabled
10 = Error Condition
11 = Not available
Bits 2-1: Reserved-all bits set to 1

A.368 LANE DEPARTURE INDICATION

Identifies the in-lane or out-of-lane status of the vehicle.

Parameter Data Length: 1 Character
Data Type: Binary Bit-Mapped
Bit Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: 0.1 s when active, or on change of state
Message Priority: 2
Format:

PID	Data
368	a
a—	Lane departure indication Bits 8-7: Left side indication status Bits 6-5: Right side indication status Bits 4-1: Reserved-all bits set to 1

NOTE: Each status will be described using the following nomenclature:

00	Not Active/Out of lane not detected
01	Active/Out of lane detected
10	Error condition
11	Not available

A.369 DISTANCE TO REAR OBJECT (REVERSE)

Measures the distance from the back of the vehicle to the nearest object. The device sends a message only when the transmission is in reverse.

Parameter Data Length: 1 Character
Data Type: Unsigned Integer
Bit Resolution: 0.1 m (0.328 ft)
Maximum Range: 0.0 to 25.0 m (0.0 to 82.0 ft)
Transmission Update: 0.1 s (when transmission is in reverse)
Message Priority: 2
Format:

PID	Data
369	a
a—	Distance to object from rear of vehicle 0-250 = Distance to object from rear of vehicle 251–253 = Reserved for future assignment by SAE 254 = Error 255 = Not available

A.370 TRAILER PNEUMATIC BRAKE CONTROL LINE PRESSURE

Gage pressure of air in the pneumatic line that controls the brake application of the trailer, measured at the tractor. (Service Brakes)

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 4.14 kPa (0.6 lbf/in²)
Maximum Range: 0.0 to 1055 kPa (0.0 to 153.0 lbf/in²)
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
370	a
a—	Trailer pneumatic brake control line pressure (service brakes)

A.371 TRAILER PNEUMATIC SUPPLY LINE PRESSURE

Gage pressure of air in the pneumatic line that supplies air to the trailer pneumatic system, measured at the tractor. Typically controlled by the trailer supply valve. (Red Button)

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 4.14 kPa (0.6 lbf/in²)
Maximum Range: 0.0 to 1055 kPa (0.0 to 153.0 lbf/in²)
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
371	a
a—	Trailer pneumatic supply line pressure

A.372 REMOTE ACCELERATOR

Ratio of the actual remote accelerator position to the maximum remote accelerator position.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.4%
Maximum Range: 0.0 to 102.0%
Transmission Update Period: 0.1 s
Message Priority: 4
Format:

PID	Data
372	a
a—	Remote accelerator percent

NOTE: The remote accelerator enable switch must be enabled and the accelerator interlock switch must be inactive before the remote accelerator can be used by engine controller.

A.373 CENTER REAR DRIVE AXLE TEMPERATURE

Temperature of axle lubricant in center rear drive axle.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 1.2 °F
Maximum Range: 0.0 to 306.0 °F
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
373	a
a—	Center rear drive axle temperature

NOTE: See PIDs 77 and 78 for related drive axle temperature information. This PID is intended for use on powered vehicles utilizing more than two rear drive axles.

A.374 ALTERNATOR AC VOLTAGE

Measurement of AC (RMS) voltage at the alternator output.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.125 V
Maximum Range: 0 to 31.875 V
Transmission Update Period: On request
Message Priority: 7
Format:

PID	Data
374	a
a—	Alternator AC voltage

A.375 FUEL RETURN PRESSURE

Pressure in fuel return line used to detect line blockage.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.5 psi
Maximum Range: 0 to 127.5 psi
Transmission Update Period: On request
Message Priority: 7
Format:

PID	Data
375	a
a—	Fuel return pressure (psi)

A.376 FUEL PUMP INLET VACUUM

Vacuum reading on inlet side of the fuel pump (after the primary fuel filter).

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.2 in Hg
Maximum Range: 0 to 51.0 in Hg
Transmission Update Period: On request
Message Priority: 7
Format:

PID	Data
376	a
a—	Fuel pump inlet vacuum

A.377 COMPRESSION UNBALANCE

The percent difference between the highest and the lowest compression values in an engine cycle as determined by monitoring the starter current.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Bit Resolution: 0.5%
Maximum Range: 0.0 to 127.5%
Transmission Update Period: On request
Message Priority: 7
Format:

PID	Data
377	a
a—	Compression unbalance

A.378 FARE COLLECTION UNIT STATUS

Used to report alarms of the fare collection unit.

Parameter Data Length: 1 Character
Data Type: Binary Bit-mapped
Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: On change
Message Priority: 6
Format:

PID Data
378 a
a— Fare collection unit status
Bit 8: 0 = non-emergency status
1 = emergency condition
Bits 7-1: Alarm identifier (128 values)
0 = voltage dropout
1 = voltage restored
2 = probe started
3 = probe completed
4 = cashbox removed
5 = cashbox restored
6 = cashbox door timeout
7 = cashbox opened in service (see note)
8 = insufficient fare accepted
9 = coinbox 75% full
10 = coinbox full
11 = currency box 75% full
12 = currency box less than 75% full
13 = currency box full
14 = card/pass box 75% full
15 = card/pass box less than 75% full
16 = card/pass box full
17 = coin de-jam operated
18 = farebox set in manual bypass
19 = farebox reset to automatic mode
20 = pass/transfer jam
21 = pass/transfer jam cleared
22 = paper currency jam
23 = paper currency jam cleared
24 = maintenance access—in service (see note)
25 = maintenance access—out or service
26-96 = reserved—to be assigned
97-127 = Agency defined

NOTE: Alarms 7 and 24 are defined as emergency alarm conditions. Other alarms may be defined as emergency alarm conditions as required by the farebox owner.

A.379 DOOR STATUS

Used to report the open or closed status of a given door.

Parameter Data Length: 1 Character
Data Type: Binary Bit-mapped
Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: On change or on request
Message Priority: 7
Format:

PID	Data
379	a
a—	Door status Bits 8-5:Reserved—all bits set to 1 Bits 4-3: Trailer cargo door status Bits 2-1:Transit door status

NOTE: Each status will be described using the following nomenclature:

00	Door Closed
01	Door Open
10	Error condition
11	Not available

A.380 ARTICULATION ANGLE

Angle of deflection of an articulation turntable of an articulated transit vehicle. A right turn is indicated with a positive angle and a left turn is indicated with a negative angle.

Parameter Data Length: 1 Character
Data Type: Signed Short Integer
Bit Resolution: 1 degree
Maximum Range: –128 to +127 degree
Transmission Update Period: 1.0 s
Message Priority: 8
Format:

PID	Data
380	a
a—	Articulation angle

A.381 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 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.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Resolution: Binary Bit-mapped
Maximum Range: 0 to 255
Transmission Update Period: As needed (10 s updates while an unauthorized condition exists)
Message Priority: 7
Format:

PID	Data
381	a
a—	Vehicle use status
	Bits 8-5: Reserved—all bits set to 1
	Bits 4-3: Vehicle use status
	00—Normal use
	01—Unauthorized use
	10—Error condition
	11—Not available
	Bits 2-1: Transit run status
	00—Off
	01—On
	10—Error condition
	11—Not available

A.382 TRANSIT SILENT ALARM STATUS

Used to report silent alarm push button status.

Parameter Data Length: 1 Character
Data Type: Unsigned Short Integer
Resolution: Binary Bit-mapped
Maximum Range: 0 to 255
Transmission Update Period: As needed
Message Priority: 7
Format:

PID	Data
382	a
a	Transit silent alarm status
	Bits 8-3: Reserved—all bits set to 1
	Bits 2-1: Silent alarm status

NOTE: Each status will be described using the following nomenclature:

00	Off
10	On
10	Error Condition
11	Not available

A.383 VEHICLE ACCELERATION

Scalar acceleration of vehicle. Negative numbers imply deceleration.

Parameter Data Length: 1 Character
Data Type: Signed Short Integer
Bit Resolution: 0.322 (km/h)/s (0.2 mph/s)
Maximum Range: –41.216 to 40.894 (km/h)/s (–25.6 to 25.4 mph/s)
Transmission Update Period: As requested
Message Priority: 6
Format:

PID	Data
383	a

a— Vehicle acceleration

A.384 COMPONENT-SPECIFIC REQUEST PARAMETER

Used to request page 2 parameter data (PID) transmissions from a specified component on the data link.

Parameter Data Length: 2 Characters
Data Type: Unsigned Short Integer (both characters)
Resolution: Binary (both characters)
Maximum Range: 0 to 255 (both characters)
Transmission Update Period: As needed
Message Priority: 8
Format:

PID	Data
384	a b

a— Parameter number of the requested parameter from page 2 (transmitted modulo 256)
b— MID of the component from which the parameter data is requested

Only the specified component should transmit the specified parameter. If the specified component is in the MID range 0 to 127, its response is not defined in this document.

A.385 INTAKE VALVE ACTUATION SYSTEM OIL PRESSURE

The gauge pressure of the oil in the hydraulic accumulator that powers the intake valve actuation system.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 1/256 MPa
Maximum Range: 0 to 255.996 MPa
Transmission Update Period: On request
Message Priority: 5
Format:

PID	Data
385	a a

a— Intake Valve Actuation System Oil Pressure

A.386 EVAPORATOR COIL TEMPERATURE, ZONE #1

Temperature of the evaporator coil air sensor for zone #1 in a trailer.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 0.1 °F
Maximum Range: -3276.8 to +3276.7 °F
Transmission Update Period: 1.0 s
Message Priority: 8
Format:

PID	Data
386	a a
a—	Evaporator Coil Temperature for Zone #1

NOTE: See PIDs 387 and 388 for additional Evaporator Coil Temperature Zone parameters. If only one trailer refrigeration zone exists, PID 386 should be used.

A.387 EVAPORATOR COIL TEMPERATURE, ZONE #2

Temperature of the evaporator coil air sensor for zone #2 in a trailer.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 0.1 °F
Maximum Range: -3276.8 to +3276.7 °F
Transmission Update Period: 1.0 s
Message Priority: 8
Format:

PID	Data
387	a a
a—	Evaporator Coil Temperature for Zone #2.

NOTE: See PIDs 386 and 388 for additional Evaporator Coil Temperature Zone parameters. If only one trailer refrigeration zone exists, PID 386 should be used.

A.388 EVAPORATOR COIL TEMPERATURE, ZONE #3

Temperature of the evaporator coil air sensor for zone #3 in a trailer.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 0.1 °F
Maximum Range: -3276.8 to +3276.7 °F
Transmission Update Period: 1.0 s
Message Priority: 8
Format:

PID	Data
388	a a
a—	Evaporator Coil Temperature for Zone #3.

NOTE: See PIDs 386 and 387 for additional Evaporator Coil Temperature Zone parameters. If only one trailer refrigeration zone exists, PID 386 should be used.

A.389 CARGO TEMPERATURE SETPOINT, ZONE #1

Refrigerated cargo setpoint temperature for zone #1 in a trailer.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 0.1 °F
Maximum Range: -3276.8 to +3276.7 °F
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
389	a a
a—	Cargo Temperature Setpoint, Zone #1.

NOTE: See PIDs 390 and 391 for additional Cargo Temperature Setpoint Zone parameters. If only one trailer refrigeration zone exists, PID 389 should be used.

A.390 CARGO TEMPERATURE SETPOINT, ZONE #2

Refrigerated cargo setpoint temperature for zone #2 in a trailer.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 0.1 °F
Maximum Range: -3276.8 to +3276.7 °F
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
391	a a
a—	Cargo Temperature Setpoint, Zone #2.

NOTE: See PIDs 389 and 391 for additional Cargo Temperature Setpoint Zone parameters. If only one trailer refrigeration zone exists, PID 389 should be used.

A.391 CARGO TEMPERATURE SETPOINT, ZONE #3

Refrigerated cargo setpoint temperature for zone #3 in a trailer.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 0.1 °F
Maximum Range: -3276.8 to +3276.7 °F
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
392	a a
a—	Cargo Temperature Setpoint, Zone #3.

NOTE: See PIDs 389 and 390 for additional Cargo Temperature Setpoint Zone parameters. If only one trailer refrigeration zone exists, PID 389 should be used.

A.392 EVAPORATOR SUPPLY (DISCHARGE) AIR TEMPERATURE #2, ZONE #1

Temperature #2 of the supply air for zone #1 in a trailer.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 0.1 °F
Maximum Range: -3276.8 to +3276.7 °F
Transmission Update Period: 1.0 s
Message Priority: 8
Format:

PID	Data
392	a a
a—	Evaporator Supply (Discharge) Air Temperature #2, Zone #1.

NOTE: See PIDs 393 and 394 for additional Evaporator supply (Discharge) Air Temperature #2 Zone parameters. If only one trailer refrigeration zone exists, PID 392 should be used.

A.393 EVAPORATOR SUPPLY (DISCHARGE) AIR TEMPERATURE #2, ZONE #2

Temperature #2 of the supply air for zone #2 in a trailer.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 0.1 °F
Maximum Range: -3276.8 to +3276.7 °F
Transmission Update Period: 1.0 s
Message Priority: 8
Format:

PID	Data
393	a a
a—	Evaporator Supply (Discharge) Air Temperature #2, Zone #2.

NOTE: See PIDs 392 and 394 for additional Evaporator supply (Discharge) Air Temperature #2 Zone parameters. If only one trailer refrigeration zone exists, PID 392 should be used.

A.394 EVAPORATOR SUPPLY (DISCHARGE) AIR TEMPERATURE #2, ZONE #3

Temperature #2 of the supply air for zone #3 in a trailer.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 0.1 °F
Maximum Range: -3276.8 to +3276.7 °F
Transmission Update Period: 1.0 s
Message Priority: 8
Format:

PID	Data
394	a a
a—	Evaporator Supply (Discharge) Air Temperature #2, Zone #3.

NOTE: See PIDs 392 and 393 for additional Evaporator supply (Discharge) Air Temperature #2 Zone parameters. If only one trailer refrigeration zone exists, PID 392 should be used.

A.395 EVAPORATOR SUPPLY (DISCHARGE) AIR TEMPERATURE #1, ZONE #1

Temperature #1 of the supply air for zone #1 in a trailer.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 0.1 °F
Maximum Range: -3276.8 to +3276.7 °F
Transmission Update Period: 1.0 s
Message Priority: 8
Format:

PID	Data
395	a a
a—	Evaporator Supply (Discharge) Air Temperature #1, Zone #1.

NOTE: See PIDs 396 and 397 for additional Evaporator supply (Discharge) Air Temperature #1 Zone parameters. If only one trailer refrigeration zone exists, PID 395 should be used.

A.396 EVAPORATOR SUPPLY (DISCHARGE) AIR TEMPERATURE #1, ZONE #2

Temperature #1 of the supply air for zone #2 in a trailer.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 0.1 °F
Maximum Range: -3276.8 to +3276.7 °F
Transmission Update Period: 1.0 s
Message Priority: 8
Format:

PID	Data
396	a a
a—	Evaporator Supply (Discharge) Air Temperature #1, Zone #2.

NOTE: See PIDs 395 and 397 for additional Evaporator supply (Discharge) Air Temperature #1 Zone parameters. If only one trailer refrigeration zone exists, PID 395 should be used.

A.397 EVAPORATOR SUPPLY (DISCHARGE) AIR TEMPERATURE #1, ZONE #3

Temperature #1 of the supply air for zone #3 in a trailer.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 0.1 °F
Maximum Range: -3276.8 to +3276.7 °F
Transmission Update Period: 1.0 s
Message Priority: 8
Format:

PID	Data
397	a a
a—	Evaporator Supply (Discharge) Air Temperature #1, Zone #3.

NOTE: See PIDs 395 and 396 for additional Evaporator supply (Discharge) Air Temperature #1 Zone parameters. If only one trailer refrigeration zone exists, PID 395 should be used.

A.398 EVAPORATOR RETURN AIR TEMPERATURE #2, ZONE #1

Temperature #2 of the evaporator return air for zone #1 in a trailer.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 0.1 °F
Maximum Range: -3276.8 to +3276.7 °F
Transmission Update Period: 1.0 s
Message Priority: 8
Format:

PID	Data
398	a a
a—	Evaporator Return Air Temperature #2, Zone #1

NOTE: See PIDs 399 and 400 for additional Evaporator return air temperature zone parameters. If only one trailer refrigeration zone exists, PID 398 should be used.

A.399 EVAPORATOR RETURN AIR TEMPERATURE #2, ZONE #2

Temperature #2 of the evaporator return air for zone #2 in a trailer.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 0.1 °F
Maximum Range: -3276.8 to +3276.7 °F
Transmission Update Period: 1.0 s
Message Priority: 8
Format:

PID	Data
399	a a
a—	Evaporator Return Air Temperature #2, Zone #2

NOTE: See PIDs 398 and 400 for additional Evaporator return air temperature zone parameters. If only one trailer refrigeration zone exists, PID 398 should be used.

A.400 EVAPORATOR RETURN AIR TEMPERATURE #2, ZONE #3

Temperature #2 of the evaporator return air for zone #3 in a trailer.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 0.1 °F
Maximum Range: -3276.8 to +3276.7 °F
Transmission Update Period: 1.0 s
Message Priority: 8
Format:

PID	Data
400	a a
a—	Evaporator Return Air Temperature #2, Zone #3

NOTE: See PIDs 398 and 399 for additional Evaporator return air temperature zone parameters. If only one trailer refrigeration zone exists, PID 398 should be used.

A.401 EVAPORATOR RETURN AIR TEMPERATURE #1, ZONE #1

Temperature #1 of the evaporator return air for zone #1 in a trailer.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 0.1 °F
Maximum Range: -3276.8 to +3276.7 °F
Transmission Update Period: 1.0 s
Message Priority: 8
Format:

PID	Data
401	a a
a—	Evaporator Return Air Temperature #1, Zone #1

NOTE: See PIDs 402 and 403 for additional Evaporator return air temperature zone parameters. If only one trailer refrigeration zone exists, PID 401 should be used.

A.402 EVAPORATOR RETURN AIR TEMPERATURE #1, ZONE #2

Temperature #1 of the evaporator return air for zone #2 in a trailer.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 0.1 °F
Maximum Range: -3276.8 to +3276.7 °F
Transmission Update Period: 1.0 s
Message Priority: 8
Format:

PID	Data
402	a a
a—	Evaporator Return Air Temperature #1, Zone #2

NOTE: See PIDs 401 and 403 for additional Evaporator return air temperature zone parameters. If only one trailer refrigeration zone exists, PID 401 should be used.

A.403 EVAPORATOR RETURN AIR TEMPERATURE #1, ZONE #3

Temperature #1 of the evaporator return air for zone #3 in a trailer.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 0.1 °F
Maximum Range: -3276.8 to +3276.7 °F
Transmission Update Period: 1.0 s
Message Priority: 8
Format:

PID	Data
403	a a
a—	Evaporator Return Air Temperature #1, Zone #3

NOTE: See PIDs 401 and 402 for additional Evaporator return air temperature zone parameters. If only one trailer refrigeration zone exists, PID 401 should be used.

A.404 TURBOCHARGER COMPRESSOR OUTLET TEMPERATURE

Temperature of the air exiting the turbocharger compressor outlet.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 0.25 °F
Maximum Range: -8192.00 to +8191.75 °F
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
404	a a
a—	Turbocharger compressor outlet temperature

A.405 SAFETY RESTRAINT SYSTEM TRIGGER STATUS

Indicates that the Safety Restraint System (SRS) has triggered. This data will be used by data loggers, diagnostic equipment, and emergency communications devices.

Parameter Data Length: 2 Character
Data Type: Binary Bit-Mapped
Bit Resolution: Binary
Maximum Range: 0 to 255 (each character)
Transmission Update Period: On change or on request
Message Priority: 4
Format:

PID	Data
405	a b
a—	SRS trigger status #1 Bits 8-7: Right side rollover trigger Bits 6-5: Left side impact trigger Bits 4-3: Right side impact trigger Bits 2-1: Frontal impact trigger
b—	SRS trigger status #2 Bits 8-3: Reserved—all bits set to 1 Bits 2-1: Left side rollover trigger

NOTE: Each status will be described using the following nomenclature:

00	No trigger
01	Trigger
10	Error condition
11	Not available

A.406 HVAC BLOWER MOTOR SPEED

Rotational velocity of blower motor rotor shaft.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.25 rpm
Maximum Range: 0 to 16383.75 rpm
Transmission Update Period: On request
Message Priority: 7
Format:

PID	Data
406	a a
a a—	HVAC blower motor speed

A.407 AXLE GROUP FULL WEIGHT CALIBRATION

Allows for communication of the existing full weight calibration measurement of an axle or axle group.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 17.792 n (4.0 lbf)
Maximum Range: 0.0 to 1166056.9 N (0.0 to 262140.0 lbf)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
407	a a
a a—	Axle group full weight at time of calibration

A.408 AXLE GROUP EMPTY WEIGHT CALIBRATION

Allows for communication of the existing empty weight calibration measurement of an axle or axle group.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 17.792 n (4.0 lbf)
Maximum Range: 0.0 to 1166056.9 N (0.0 to 262140.0 lbf)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
408	a a
a a—	Axle group empty weight at time of calibration

A.409 AXLE GROUP WEIGHT

Force of gravity imposed on the road surface by all the tires in an axle group.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 17.792 n (4.0 lbf)
Maximum Range: 0.0 to 1166056.9 N (0.0 to 262140.0 lbf)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
409	a a
a a—	Axle group weight

A.410 EXTENDED RANGE ROAD SURFACE TEMPERATURE

Indicated temperature of road surface over which vehicle is operating.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 0.25 °F
Maximum Range: –8192.00 °F to +8191.75 °F
Transmission Update Period: 1.0 s or on change of > 5 °F
Message Priority: 5
Format:

PID	Data
410	a a
a a—	Extended range road surface temperature

NOTE: See also PID 79.

A.411 RECIRCULATED ENGINE EXHAUST GAS DIFFERENTIAL PRESSURE

Current differential pressure across the engine EGR system.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 1/128 kPa/bit
Maximum Range: –250 to 251.99 kPa
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
411	a a
a a—	Recirculated Engine Exhaust Gas Differential Pressure

A.412 RECIRCULATED ENGINE EXHAUST GAS TEMPERATURE

Current temperature of re-circulated engine exhaust gas.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 0.25 °F
Maximum Range: –8192 to +8191.75 °F
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
412	a a
a a—	Recirculated Engine Exhaust Gas Temperature

A.413 NET VEHICLE WEIGHT CHANGE

Identifies Net Vehicle Weight Change from the time of last vehicle net weight zeroing.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 17.792 n (4.0 lbs)
Maximum Range: –583020.1 to 583037.3 n (–131068.0 to 131072.0 lbs)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
413	a a
a a—	Net Vehicle Weight Change

A.414 AIR CONDITIONER REFRIGERANT LOW SIDE PRESSURE

Gage pressure of the refrigerant on the low pressure (suction) side of the air conditioning system.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 1.379 kPa (0.20 lbf/in²)
Maximum Range: –45185 to 45184 kPa (–6553.6 to +6553.4 lbf/in²)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
414	a a
a a—	Low side pressure

A.415 AIR CONDITIONER REFRIGERANT HIGH SIDE PRESSURE

Gage pressure of the refrigerant on the high pressure side of the air conditioning system.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 1.379 kPa (0.20 lbf/in²)
Maximum Range: –45185 to 45184 kPa (–6553.6 to +6553.4 lbf/in²)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
415	a a
a a—	High side pressure

A.416 EVAPORATOR TEMPERATURE

Temperature of the air conditioner evaporator core or the temperature of the refrigerant in or near the evaporator core.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 0.25 °F
Maximum Range: –8192.00 to +8191.75 °F
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
416	a a
a a—	Evaporator temperature

A.417 GROSS VEHICLE WEIGHT

The PID will allow communication of the Gross Vehicle Weight

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 17.792 N (4.0 lbf)
Maximum Range: 0.0 to 1166056.9 N (0.0 to 262140.0 lbf)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
417	a a
a a—	Gross vehicle weight

A.418 TRANSMISSION #2 OIL TEMPERATURE

Temperature of transmission #2 lubricant.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 0.25 °F
Maximum Range: –8192.00 to +8191.75 °F
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
418	a a
a a—	Transmission #2 oil temperature

A.419 STARTER CIRCUIT RESISTANCE

Resistance of the starter circuit external to the battery.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.25 milli-ohm
Maximum Range: 0 to 16383.75 milli-ohm
Transmission Update Period: On request
Message Priority: 7
Format:

PID	Data
419	a a
a a	Starter circuit resistance

A.420 STARTER CURRENT (AVERAGE)

Starter current as averaged over the update period.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.125 A
Maximum Range: 0 to 8191.875 A
Transmission Update Period: On request
Message Priority: 7
Format:

PID	Data
420	a a
a a	Starter average current

A.421 ALTERNATOR/GENERATOR NEGATIVE CABLE VOLTAGE

Voltage measured at the negative cable of the vehicle alternator/generator.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.0001 V
Maximum Range: 0.0 to 6.5535 V
Transmission Update Period: On request
Message Priority: 7
Format:

PID	Data
421	a a
a a—	Alternator ground path voltage drop

A.422 AUXILIARY CURRENT

Auxiliary current measurement.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 0.125 A
Maximum Range: –4095.875 to +4096 A
Transmission Update Period: On request
Message Priority: 7
Format:

PID	Data
422	a a
a a—	Current

A.423 EXTENDED RANGE NET BATTERY CURRENT

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

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 0.125 A
Maximum Range: –4095.875 to +4096 A
Transmission Update Period: On request
Message Priority: 7
Format:

PID	Data
423	a a
a a—	Net battery current

A.424 DC VOLTAGE

Auxiliary DC voltage measurement.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.05 V
Maximum Range: 0 to 3276.75 V
Transmission Update Period: On request
Message Priority: 7
Format:

PID	Data
424	a a
a a—	DC voltage

A.425 AUXILIARY FREQUENCY

Frequency measurement.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.1 Hz
Maximum Range: 0 to 6553.5 Hz
Transmission Update Period: On request
Message Priority: 7
Format:

PID	Data
425	a a
a a—	Frequency

A.426 ALTERNATOR/GENERATOR FIELD VOLTAGE

Voltage measured at the field windings.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.05 V
Maximum Range: 0.0 to 3276.75 V
Transmission Update Period: On request
Message Priority: 7
Format:

PID	Data
426	a a
a a—	Field voltage

A.427 BATTERY RESISTANCE CHANGE

Internal resistance change of the battery calculated by simultaneously measuring battery voltage and current over time.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.25 mill-ohm per second
Maximum Range: 0 to 16383.75 mill-ohm/sec
Transmission Update Period: On request
Message Priority: 7
Format:

PID	Data
427	a a
a a—	Internal battery resistance change

A.428 BATTERY INTERNAL RESISTANCE

Total resistance internal to the battery or batteries as defined by the equivalent circuit for a battery or batteries.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.25 mill-ohm
Maximum Range: 0 to 16383.75 mill-ohm
Transmission Update Period: On request
Message Priority: 7
Format:

PID	Data
428	a a
a a—	Internal battery resistance

A.429 STARTER CURRENT PEAK

Current measured when the starter is engaged, before armature movement.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.125 A
Maximum Range: 0 to 8191.875 A
Transmission Update Period: On request
Message Priority: 7
Format:

PID	Data
429	a a
a a—	Starter peak current

A.430 STARTER SOLENOID VOLTAGE

Voltage measured at the positive terminal of the starter solenoid.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.05 V
Maximum Range: 0.0 to 3276.75 V
Transmission Update Period: On request
Message Priority: 7
Format:

PID	Data
430	a a
a a—	Starter solenoid voltage

A.431 STARTER NEGATIVE CABLE VOLTAGE

Voltage drop measured on the starter motor ground path.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.0001 V
Maximum Range: 0.0 to 6.5535 V
Transmission Update Period: On request
Message Priority: 7
Format:

PID	Data
431	a a
a a—	Ground path voltage drop

A.432 STARTER MOTOR VOLTAGE

Voltage measured at the positive terminal of the starter motor.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.05 V
Maximum Range: 0.0 to 3276.75 V
Transmission Update Period: On request
Message Priority: 7
Format:

PID	Data
432	a a
a a—	Starter motor voltage

A.433 FUEL SHUTOFF SOLENOID VOLTAGE

Voltage measured at the positive terminal of the fuel shutoff solenoid.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.05 V
Maximum Range: 0.0 to 3276.75 V
Transmission Update Period: On request
Message Priority: 7
Format:

PID	Data
433	a a
a a—	Fuel shutoff solenoid voltage

A.434 AC VOLTAGE

Auxiliary AC voltage measurement (RMS).

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.125 V
Maximum Range: 0 to 8191.875 V
Transmission Update Period: On request
Message Priority: 7
Format:

PID	Data
434	a a
a a—	AC voltage

A.435 CARGO AMBIENT TEMPERATURE (BY LOCATION)

Temperature of air inside vehicle container used to accommodate cargo.

Parameter Data Length: 2 Characters
Data Type: Character 1 = Binary Bit-mapped
Character 2 = Signed Integer
Bit Resolution: Character 1 = Binary
Character 2 = 1 °F/ Bit
Maximum Range: Character 1 = 0 to 255
Character 2 = –128 °F to +127 °F
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
435	a b
a—	Location of the air temperature 0 = Temperature up front 1 = Temperature down front 2 = Temperature up rear 3 = Temperature down rear 4-255 = Reserved
b—	Cargo ambient temperature

NOTE: See also PID 169.

A.436 TRIP SUDDEN DECELERATIONS

Total number of decelerations whenever the vehicle is more than XYZ km/h/s (where XYZ is a calibrated threshold), since the last trip reset. A lengthy deceleration shall be counted as one sudden deceleration.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 1 count/bit
Maximum Range: 0 to 65535
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
436	a a
a a—	Trip sudden decelerations

A.437 TRAILER #2, TAG #2, OR PUSH CHANNEL #2 TIRE PRESSURE TARGET

The tire pressure control system's target gage pressure for the trailer #2, tag #2, or push #2 group of tires.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.689 kPa (0.1 lbf/in²)
Maximum Range: 0.0 to 45153.6 kPa (0.0 to 6553.5 lbf/in²)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
437	a a
a a—	Trailer #2, tag #2, or push #2 tire pressure target

NOTE: See also PID 141.

A.438 TRAILER #2, TAG #2, OR PUSH CHANNEL #2 TIRE PRESSURE

The latest gage pressure reading of the trailer #2, tag #2, or push #2 group of tires, as opposed to the pressure in each tire.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.689 kPa (0.1 lbf/in²)
Maximum Range: 0.0 to 45153.6 kPa (0.0 to 6553.5 lbf/in²)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
438	a a
a a—	Trailer #2, tag #2, or push #2 tire pressure

NOTE: See also PID 144.

A.439 EXTENDED RANGE BOOST PRESSURE #1

Gage pressure of air is measured downstream on the compressor discharge side.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.125 kPa (0.018 lbf/in²)
Maximum Range: 0.0 to 8191.875 kPa (0.0 to 1188.131 lbf/in²)
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
439	a a
a a—	Extended range boost pressure #1

NOTE: If only one pressure is reported, Extended Range Boost Pressure #1 should be used. If two or more turbochargers are used in series and all are to be reported, the Extended Range Boost Pressure #1 should reflect the first of the series. If boost pressures are to be reported as left bank/right bank, Extended Range Boost Pressure #1 should report the left bank. The Extended Range Boost Pressure #2 (PID 440) should be used for the second in series or the right bank as needed.

Extended Range Boost Pressure #1 should be used instead of PID 102 if pressures higher than 32 lbf/in² (219.8 kPa) are desired.

A.440 EXTENDED RANGE BOOST PRESSURE #2

Gage pressure of air is measured downstream on the compressor discharge side.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.125 kPa (0.018 lbf/in²)
Maximum Range: 0.0 to 8191.875 kPa (0.0 to 1188.131 lbf/in²)
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
440	a a
a a—	Extended range boost pressure #2

NOTE: If only one pressure is reported, Extended Range Boost Pressure #1 (PID 439) should be used. If two or more turbochargers are used in series and all are to be reported, the Extended Range Boost Pressure #1 (PID 439) should reflect the first of the series. If boost pressures are to be reported as left bank/right bank, Extended Range Boost Pressure #1 (PID 439) should report the left bank. The Extended Range Boost Pressure #2 should be used for the second in series or the right bank as needed.

A.441 AUXILIARY TEMPERATURE #1

Auxiliary sensor #1 temperature reading. Not to be used in place of existing PIDs.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 0.1 °F
Maximum Range: –3276.8 to +3276.7 °F
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
441	a a
a a—	Auxiliary temperature #1

NOTE: See also PID 442.

A.442 AUXILIARY TEMPERATURE #2

Auxiliary sensor #2 temperature reading. Not to be used in place of existing PIDs.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 0.1 °F
Maximum Range: –3276.8 to +3276.7 °F
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
442	a a
a a—	Auxiliary temperature #2

NOTE: See also PID 441.

A.443 AUXILIARY GAGE PRESSURE READING #2

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

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.689 kPa (0.1 lbf/in^2)
Maximum Range: 0.0 to 45153.6 kPa (0.0 to 6553.5 lbf/in^2)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
443	a a
a a—	Auxiliary gage pressure reading #2

NOTE: See also PID 137.

A.444 BATTERY #2 POTENTIAL (VOLTAGE)

Measured electrical of the isolated battery #2.

Parameter Data Length: 2 Characters
Data Type: Unsigned Integer
Bit Resolution: 0.05 V
Maximum Range: 0.0 to 3.276.75 V
Transmission Update Period: 1.0 s
Message Priority: 5
Format:

PID	Data
444	a a
a a—	Battery #2 potential (voltage)

NOTE: See also PID 168.

A.445 CYLINDER HEAD TEMPERATURE BANK B (RIGHT)

Temperature of cylinder head on the bank B (or right) side of the engine.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 0.25 °F
Maximum Range: –8192.00 to +8191.75 °F
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
445	a a
a a—	Cylinder head temperature bank B (right)

A.446 CYLINDER HEAD TEMPERATURE BANK A (LEFT)

Temperature of cylinder head on the bank A (or left) side of the engine.

Parameter Data Length: 2 Characters
Data Type: Signed Integer
Bit Resolution: 0.25 °F
Maximum Range: –8192.00 to +8191.75 °F
Transmission Update Period: 1.0 s
Message Priority: 4
Format:

PID	Data
446	a a
a a—	Cylinder head temperature bank A (left)

A.447 PASSENGER COUNTER

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.

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 PID, a fare collection PID, or other signal which can define the end of the boarding/exiting period and a stable underway totalized passenger count.

Parameter Data Length: 2 Characters
Data Type: Unsigned Short Integer (both characters)
Resolution: Binary (both characters)
Maximum Range: 0 to 255 (both characters)
Transmission Update Period: As needed; following door closures or upon boarding event, depending on technology
Message Priority: 8
Format:

PID	Data
447	a b
a—	Type of 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 255—reserved
b—	patron count if character a = 0, character b indicates the number of patrons currently on vehicle after the door has closed if character a = 1 or 2, character b indicates an incremental count of passengers since the last data transmittal

A.448 PAGE 2 MULTISECTION PARAMETER

Used to transmit parameters that are longer than what is limited by SAE J1708. A specified parameter can be broken into sections with each section being transmitted in a different message.

Parameter Data Length: Variable
Data Type: Defined by specified sectioned parameter
Resolution: Defined by specified sectioned parameter
Maximum Range: Defined by specified sectioned parameter
Transmission Update Period: Defined by specified sectioned parameter
Message Priority: Parameter specific
Format:

PID	Data
448	n,a,b,c/d,c,c,c,c,c,c,c

n— Byte count of data that follows this character. This excludes characters MID, PID 448, and n, but it includes a, b, c, or d type characters.

a— PID from page 2 (PIDs 256 to 510) specifying the parameter that has been selected.

b— The last section number (total number of sections minus ONE) and the current section number. The upper nibble contains the last section number (1 to 15). The lower nibble contains the current section number and is limited to the range 0 to 15. Section numbers are assigned in ascending order.

c— Data portion of sectioned parameters. May be 1 to 13 characters in the first packet as byte d is transmitted only in the first packet. May be 1 to 14 characters in the middle and ending packets.

d— Total byte count of the original data. It is the same value as the byte count of the parameter being sectioned. This character is broadcast only in the first packet. The value must be greater than 16 but is limited to 224.

Application Notes:

1. Single sections of data are not allowed to be sent alone. Message packets must be sent in sequence from the transmitting device.

2. Receiver devices should have the capacity to receive concurrent PID 448 type messages from different transmitters.

3. Caution must be taken in interpreting data. The value of a parameter with multiple sections may have been updated during the time between which the packets are sent.

4. PID 448 is used to transmit a single Page 2 PID whose length exceeds the message packet length limitation of SAE J1708. Message packets of type PID 448 may not include data from PIDs other than that given in byte ’a’ of the first packet until all data of that PID has been transferred.

A.449 REPORTING INTERVAL REQUEST

Used to request a device to change the specified transmission update period to a new interval for the given page 2 PID.

For example, this parameter may be used to change the transit door status reporting from “as needed” to “1 second” in an emergency situation.

Parameter Data Length: 3 Characters
Data Type: Character 1 = Unsigned Short Integer
Character 2 = Unsigned Short Integer
Character 3 = Unsigned Short Integer
Resolution: Character 1 = Binary
Character 2 = Binary
Character 3 = 1 s/bit
Maximum Range: 0 to 255 s
Transmission Update Period: As needed
Message Priority: 8
Format:

PID	Data
449	n a b c
n—	Number of parameter data characters = 3
a—	MID of destination device
b—	Page 2 PID
c—	Desired transmission update period for the PID defined in character b

A.450 BRIDGE FILTER CONTROL

Instructs the device connected to both the drivetrain data link and the transit link with which PIDs to repeat from the drivetrain link onto the transit link.

Drivetrain repeaters shall be programmed to transfer no message at powerup. They shall be programmed by the transit vehicle administrative computer for MIDs and PIDs to be transferred before any relay function(s) commence from the drivetrain link to the transit link.

Parameter Data Length: Variable
Data Type: Unsigned Short Integers (all characters)
Resolution: Character dependent
Maximum Range: Character dependent
Transmission Update Period: As needed
Message Priority: 8
Format:

PID	Data
450	n m ab ab ab ...
n—	Number of parameter data characters
m -	MID of device performing PID filtering
a—	The PID which needs to be made available from the drivetrain link to the transit link
b—	Transmission update period for the PID defined in character a 0 = continuous (repeat all occurrence of the PID) bit resolution: 0.2s maximum range: 0.2 to 51.0 s

NOTE: When character a = 255 and character b = 0, all subsequent character a values identify page 2 PIDs.

A.451 RESERVED

To be assigned.

A.452 RESERVED

To be assigned.

A.453 RESERVED

To be assigned.

A.454 RESERVED

To be assigned.

A.455 RESERVED

To be assigned.

A.456 RESERVED

To be assigned.

A.457 RESERVED

To be assigned.

A.458 RESERVED

To be assigned.

A.459 RESERVED

To be assigned.

A.460 DATA TRANSFER MARKER, SAE J1587 / SAE J2497 (PAGE 2)

See Appendix F.

A.461 RESERVED

To be assigned.

A.462 RESERVED

To be assigned.

A.463 RESERVED

To be assigned.

A.464 RESERVED

To be assigned.

A.465 RESERVED

To be assigned.

A.466 RESERVED

To be assigned.

A.467 RESERVED

To be assigned.

A.468 RESERVED

To be assigned.

A.469 RESERVED

To be assigned.

A.470 RESERVED

To be assigned.

A.471 RESERVED

To be assigned.

A.472 RESERVED

To be assigned.

A.473 RESERVED

To be assigned.

A.474 RESERVED

To be assigned.

A.475 RESERVED

To be assigned.

A.476 RESERVED

To be assigned.

A.477 RESERVED

To be assigned.

A.478 RESERVED

To be assigned.

A.479 RESERVED

To be assigned.

A.480 RESERVED

To be assigned.

A.481 RESERVED

To be assigned.

A.482 RESERVED

To be assigned.

A.483 RESERVED

To be assigned.

A.484 RESERVED

To be assigned.

A.485 RESERVED

To be assigned.

A.486 RESERVED

To be assigned.

A.487 RESERVED

To be assigned.

A.488 RESERVED

To be assigned.

A.489 RESERVED

To be assigned.

A.490 RESERVED

To be assigned.

A.491 RESERVED

To be assigned.

A.492 RESERVED

To be assigned.

A.493 RESERVED

To be assigned.

A.494 RESERVED

To be assigned.

A.495 RESERVED

To be assigned.

A.496 RESERVED

To be assigned.

A.497 RESERVED

To be assigned.

A.498 SEND KEYPRESS COMMAND

See Appendix D.

A.499 DRIVER INTERFACE UNIT (DIU) OBJECT/FORM COMMAND

See Appendix D.

A.500 INTERSECTION PREEMPTION STATUS AND CONFIGURATION

Status and configuration of the device used for intersection preemption.

Parameter Data Length: Variable
Data Type: Character 1 = Binary bit-mapped
Character 2 = Binary bit-mapped
Character 3-4 = Unsigned Integer
Resolution: Binary (All characters)
Maximum Range: Character dependent
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
500	n a b [c c]

n— Number of parameter data characters = 2 or 4, dependent on bits 2-1 of byte (a)

a— Interleaved data control configuration

Bits 8-7: Request/response
- 00—Message is a request directed to the emitter
- 01—Message is a response from the emitter
- 10—Error condition
- 11—Not available

Bits 6-5: Transit route ID enable
- 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

Bits 4-3: Range code enable
- 00—Range code ID NOT used for interleaved data
- 01—Range code ID used for interleaved data (if range code not enabled)
- 10—Error condition
- 11—Not available

Bits 2-1: Vehicle ID
00—Vehicle ID is NOT included in byte (c)
01—Vehicle ID is included in byte (c)
10—Error condition
11—Not available

b— Strobe activation control status
Bits 8-7: Strobe activation
00—Deactivate Strobe
01—Activate strobe
10—Error condition
11—Not available

NOTE: Strobe will flash if not overriden by transit door status, strobe is working, and emitter is in the normal mode.

Bits 6-5: Transit door enable
00—Ignore transit door status
01—Transit door status will override strobe activation
10—Error condition
11—Not available
Bits 4-1: Priority of response sent by emitter (16 values)
0 = Reserved
1 = Low priority
2 = Probe priority
3 = High priority
4-8 = Reserved+
9 = Priority set by hardware to low priority
10 = Priority set by hardware to probe priority
11 = Priority set by hardware to high priority
12 -13 = Reserved
14 = Error condition
15 = Not available

c— Vehicle ID (Values from 0 to 65535)

A.501 SIGNAGE MESSAGE

Used to identify the messages to be displayed on Destination, Head, or Next Stop signs.

Parameter Data Length: Variable
Data Type: Alphanumeric
Resolution: ASCII
Maximum Range: 0 to 255 (each character)
Transmission Update Period: Transmitted when information is entered or changed
Message Priority: 6
Format:

PID	Data
501	n a b1 b2 b3 b4

n— Number of parameter data characters
a— Record type (Uppercase ASCII Character)
“B” = Blanking on/off
“D” = Destination code
“P” = Public relations code
“N” = Next stop code
“R” = Route number
“E” = Emergency message enable/disable
“M” = Direct character message entry
“F” = Direct character message parameters
“T” = Direct character message trigger (start display)

b— Data dependent on the record type
if:

a=”B” and b1=”T” (True) then blank the signs, any other value of b1 will unblank the signs.
a=”D”, “P”, or “N” then b1, b2, b3, ... is the ASCII message code where b1 is the most significant character.
a=”R” then b1, b2, b3, ... is the ASCII route number where b1 is the most significant character.
a=”E” and b1=”T” (True) then the emergency message is enabled, any other value of b1 will disable the emergency message. The emergency message may also be disabled by a destination code input record (a=”D”).
a=”M” then:
b1=sign number (1-255, 0 is not used)
b2=line number of sign (1-255, 0 is not used)
b3=position
Bits 8-5: Horizontal position (1-15, 0 is not used)
where 1=1st character, 2=13th character, 3=25th character, etc.
Bits 4-1: Vertical position (1-15, 0 is not used)
where 1=row 1, 2=row 2, 3=row 3, etc.
b4 to b15=ASCII direct message (up to 12 characters)
a=”F” then b1 is the ASCII default parameter and b2 is the parameter value, where:
b1=”F” font type
b1=”R” retention time in tenths of seconds
b1=”B” line blank time in tenths of seconds
b1=”S” scroll rate
b1=”1”intensity
b1=”O” blink on time in tenths of seconds
b1=”P” off time in tenths of seconds
b1=”C” color
NOTE: If the “F” record type is not used then the sign will utilize its internal default parameter values
a=”T” then display the direct message as defined by the “M” and “F” record types. Direct messages are canceled by a destination code input record type (a=”D”).

NOTE: Upon receiving the warm or cold restart request PID, the sign system will reset and restore the previously displayed message.

A.502 FARE COLLECTION UNIT—SERVICE DETAIL

Used to identify service, assignments, and fare preset detail of the fare collection unit.
Parameter Data Length: 14 Characters
Data Type: Character 1 = Binary bit-mapped
Character 2 = Binary bit-mapped
Characters 3-4 = Unsigned Integer
Characters 5-6 = Unsigned Integer
Characters 7-8 = Unsigned Integer
Characters 9-10 = Unsigned Integer
Characters 11-12 = Unsigned Integer
Characters 13-14 = Unsigned Integer
Resolution: Binary (all characters)
Maximum Range: Character dependent
Transmission Update Period: Transmitted at the start, end, in service, and out of service event
Message Priority: 6
Format:

PID Data
502 n a b cc dd ee ff gg hh
n— Number of parameter data characters = 14
a— Farebox status
Bit 8: 0=farebox out of service
1=farebox in service
Bits 7-5: Trip status
0 = undefined
1 = trip start
2 = trip end
3 = undefined
4 = undefined
5 = layover start
6 = layover end
7 = undefined
Bits 4-1: Trip status
0 = North
1 = South
2 = East
3 = West
4 = In
5 = Out
6-15 = Agency defined
b— Fare presets
Bits 8-5: Reserved—to be assigned
Bits 4-1: Agency defined
cc— Trip number—range 0 to 65535
dd— Pattern number—range 0 to 65535
ee— Assigned route—range 0 to 65535
ff— Assigned run—range 0 to 65535
gg— Assigned block—range 0 to 65535
hh— Driver’s security code
0 = farebox is in reporting status
1-65535 = security code

NOTE: If this parameter is received by the farebox, values shall be accepted the same as if entered at the farebox control panel.

A.503 FARE COLLECTION UNIT—POINT OF SALE

Used to report stop level point of sale detail.

Parameter Data Length: 7 characters
Data Type: Character 1 = Binary bit-mapped
Character 2 = Binary bit-mapped
Character 3 = Binary bit-mapped
Character 4 = Binary bit-mapped
Characters 5-6 = Binary bit-mapped—transmitted least significant character first
Character 7 = Unsigned Short Integer
Resolution: Binary (all characters)
Maximum Range: Character dependent
Transmission Update Period: On occurrence
Message Priority: 6
Format:

PID Data
503 n a b c d ee f

n— Number of parameter data characters = 7

a— Type of transaction
Bits 8-5: 0=cash
1=token
2=ticket
3=pass
4=card
5=permit
6=transfer
7=free
8-11=reserved—to be assigned
12-15=agency defined
Bits 4-1: 0-11=passenger category, indicating whether the passenger paid the full fare or a reduced fare and identifies the type of passenger.
12-15=passenger category, to be agreed to by the operating agency and the fare collection equipment manufacturer.

b— Type of fare and payment details
Bits 8-5: 0=cash/no detail
1=token A
2=token B
3=ticket A
4=ticket B
5=pass A
6=pass B
7-10=reserved—to be assigned
11-15=agency defined
Bits 4-1: 0=not an upgrade
1=cash
2=token
3=ticket
4=pass
5=card
6-10=reserved—to be assigned
11-15=agency defined

c— Fare validity data and ticket category
Bits 8-5: fare validity—agency defined (range 0-15)
Bits 4-1: pass category (range 0-15)
The farebox manufacturer and agency shall define these values corresponding to the pass categories in effect at the agency.

d— Agency and service identification
Bits 8-4: agency (range 1-31, 0 reserved)
Identifies where the initial fare is paid. The definition of the agency numbering plan shall be agreed by the operating agency and the farebox manufacturer.
Bits 3-1: type of service
0=local service
1=express service
2-7=agency defined

ee— Transfer data
Bits 16-13: direction
0=North
1=South
2=East
3=West
4=In
5=Out
6-15=Agency defined
Bits 12-1: route number issuing the transfer (range 0-4095)

f— Transfer sold (range 0 to 255)
0 is reserved; a non-zero value 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.

A.504 ANNUNCIATOR VOICE MESSAGE

Used to identify the message to be announced by the annunciator(s).

Parameter Data Length: 3 Characters
Data Type: Character 1 = Binary bit-mapped
Character 2 = Unsigned Integer
Resolution: Binary (both characters)
Maximum Range: Character dependent
Transmission Update Period: As needed
Message Priority: 6
Format:

PID Data
504 n a bb

n— Number of parameter data characters = 3

a— Annunciator location and volume level
Bit 8: Front, interior
1 = generate message
0 = do not generate message
Bit 7: Middle, interior
1 = generate message
0 = do not generate message
Bit 6: Rear, interior
1 = generate message
0 = do not generate message
Bit 5: Front, external
1 = generate message
0 = do not generate message
Bits 4-1: Volume level
where 0 = minimum level available
and 15 = maximum level available

bb— Binary value of audio message to be generated (up to 65,536 preset messages)

A.505 VEHICLE CONTROL HEAD KEYBOARD MESSAGE

Used to report key depression on the vehicle control head (driver console).

Parameter Data Length: Variable
Data Type: Binary
Resolution: Binary
Maximum Range: 0 to 255 (Each character)
Transmission Update Period: As needed
Message Priority: 7
Format:

PID	Data
505	n ab ab ab ...
n—	Number of parameter data characters
a—	If zero, character b will contain the value of an IBM scan code (per IEEE AT-101 scan code definition) for a function key depression If non-zero, this byte contains the scan code value (1-255) of the key depression.
b—	If character a is zero, the value of a function key depression If character a is non-zero, this character is not transmitted.

NOTE: After the driver's keyboard/display unit receives a cold or warm restart command and its internal self test logic determines no stuck keys or other problems, the unit shall send a zero for both characters a and b as an operational status check message.

A.506 VEHICLE CONTROL HEAD DISPLAY MESSAGE

Used to display message on the vehicle control head display (driver console).

Parameter Data Length: Variable
Data Type: Alphanumeric
Resolution: ASCII (IBM-PC character set)
Maximum Range: 0 to 255 (Each character)
Transmission Update Period: As needed
Message Priority: 7
Format:

PID	Data
506	n a b cccc ...
n—	Number of parameter data characters
a—	Line position for display of ASCII characters. The value of 0 is reserved for clear screen message
b—	Segment position for display of ASCII characters, where the horizontal display line is divided into multiples of 14 displayable characters. The value of 0 is reserved for clear screen message
c—	Up to 14 ASCII characters as defined by the IBM extended ASCII character set (including the graphics values 128-255).

NOTE: If the value of characters a and b are both zero, the display shall interpret this as a clear screen command (all lines, all columns). In this case, there will be no c characters included.

If the display is equipped with a sound generating device, the receipt of an ASCII Bell character (ASCII 7) shall trigger the sound device.

A.507 DRIVER IDENTIFICATION

Used to obtain the driver identity.

Parameter Data Length: Variable
Data Type: Alphanumeric
Resolution: ASCII
Maximum Range: 0 to 255 (each character)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
507	n a a a a * b b b b

n— Number of parameter data characters
a— Characters specifying the driver identification
b— Characters specifying other driver data

The driver identification and other driver data fields are variable in length and separated by an ASCII "*". It is not necessary to include both fields; however, the delimiter ("*") is always required.

A.508 TRANSIT ROUTE IDENTIFICATION

Used to identify the Route, Run and Block information. This information may be entered into different devices at different authorities (fare collection, radio log, unit control panel, etc.). In any case, the device which is assigned as the entry device shall make the identification available to all other devices on the link with this parameter.

Parameter Data Length: Variable
Data Type: Alphanumeric
Resolution: ASCII
Maximum Range: 0 to 255 (each character)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
508	n a a a a * b b b b * c c c c

n— Number of parameter data characters
a— Characters specifying the assigned route
b— Characters specifying the assigned run
c— Characters specifying the assigned block

The route, run, and block data fields are variable in length and separated by an ASCII "*". It is not necessary to include all three fields; however, the delimiter ("*") is always required.

A.509 MILEPOST IDENTIFICATION

Used to identify the milepost as detected by a milepost sensor.

Parameter Data Length: Variable
Data Type: Alphanumeric
Resolution: ASCII
Maximum Range: 0 to 255 (each character)
Transmission Update Period: On request
Message Priority: 8
Format:

PID	Data
509	n a a a a

n— Number of parameter data characters
a— Characters identifying the milepost

A.510 PAGE 2 DATA LINK ESCAPE

This PID allows transmission of information on the data bus in a nonstandard (per the protocol outlined in SAE J1587) but specific electronic module vendor's proprietary fashion. The intent of this PID is to allow a means to use the data bus for vendor specific transmissions that do not benefit the general purpose nature of the communication data link.

Parameter Data Length: Variable
Data Type: Variable
Resolution: Variable
Maximum Range: Variable
Transmission Rate: Variable up to 10 times per second
Message Priority: Parameter specific
Format:

PID	Data
510	a b
a—	Receiving module’s MID
b—	Data

A.511 PAGE 2 EXTENSION

This PID is required to immediately follow the MID and Page 1 Extension PID for the message. (This is denoted as the MID followed by two consecutive bytes of value 255 each.) The character after this PID is a PID from page 3 (PIDs 512 to 767). All other PIDs in the messages are also from page 3.

Parameter Data Length: No data bytes
Data Type: Not applicable
Bit Resolution: Not applicable
Maximum Range: Not applicable
Transmission Update Period: Not applicable
Message Priority: Parameter specific
Format:

PID	Data
511	No data associated with PID 511

A.767 PAGE 3 EXTENSION

This PID is required to immediately follow the MID for the message. (This is denoted as the MID followed by three consecutive bytes of value 255 each.) The character after this PID is a PID from page 4 (PIDs 768 to 1023). All other PIDs in the messages are also from page 4.

Parameter Data Length: No data bytes
Data Type: Not applicable
Bit Resolution: Not applicable
Maximum Range: Not applicable
Transmission Update Period: Not applicable
Message Priority: Parameter specific
Format:

PID	Data
767	No data associated with PID 767

APPENDIX B - SAE J1587 TRANSPORT PROTOCOL

B.1 INTRODUCTION

With the advent of off-vehicle data communications there has come a need for a means to transfer data across intra-vehicle data networks which is ultimately destined for devices and systems outside the vehicle. Indeed the data may be destined for devices and systems which have no knowledge of the operations of the onboard network. As a consequence, this data may well be formatted in a manner unknown and unknowable to the average node on the onboard network; however, the data must still be transferred across the onboard network before it can be transmitted to the extra-vehicular data system.

In OSI terms this means that one onboard device must provide an application layer gateway function. There must also be provision for the segmentation and reassembly of individual messages which are too long for the individual frame defined for the onboard network. In the case of the SAE J1587/SAE J1708 onboard network, the individual frame is limited to a message size of no more than 21 bytes. Clearly the data to be transferred may well be much larger than this size; ergo, a multiple-frame message format and protocol which does not specify the format of the data to be transferred is needed.

In OSI terms, the SAE J1708 protocol serves primarily as physical and media access control layer functionality. SAE J1587 provides an application layer functionality as shown in Figure B1. The application layer parameter definitions of SAE J1587, however, while ensuring that the format of data communicated across the network is uniform, does not provide for the transfer of data using a connection oriented protocol with handshaking and flow control. In addition, the previously defined data block size using PID 192 or PID 448 is limited to 239 bytes.

Given that application, data link and physical layers exist within the SAE J1587/SAE J1708 framework, there is no intervening functionality. For instance, there is not a session, presentation, transport, or network layer.

One function generally allocated to the transport layer in the OSI model is the breaking up of data for transmission as needed, and ensuring that the pieces all arrive correctly at the other end.[1] This function is generally referred to as segmentation and reassembly.

Several transport layer protocols have been defined; the most used of these being TP4, the Connection Oriented Transport Service (COTS). COTS provides for the creation, use, and closure of an end-to-end virtual circuit between the originating application and the receiving application. TP4 also provides for the segmentation and reassembly of large messages to be transferred across the subnetworks (a subnetwork in this case would include the SAE J1587/SAE J1708 intravehicle network).

TP4 is clearly inappropriate for any heavy duty vehicle data communications. However, it is possible to implement a transport layer protocol which will use the services of the SAE J1708 network in the manner of the SAE J1587 protocol. This transport protocol will provide for the transfer of free-form data across the network, for the segmentation and reassembly of large messages to be transferred across the subnetwork, and to efficiently control the flow of free-form data across the subnetwork.

---

[1] Andrew Tannenbaum; *Computer Networks* (Englewood Cliffs, NJ:Prentice-Hall), 18.

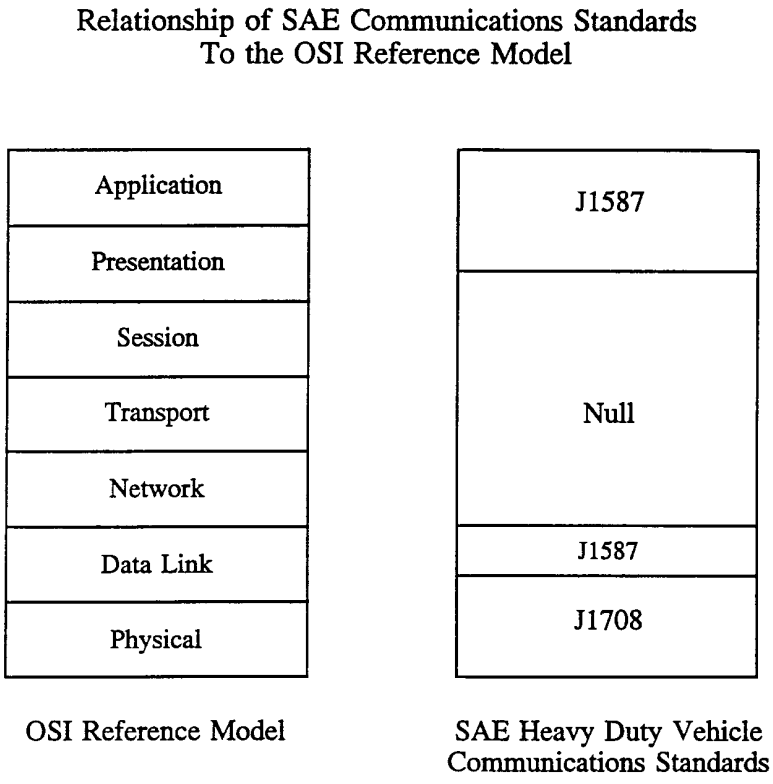


FIGURE B1 - SAE STANDARDS AND THE OSI REFERENCE MODEL

B.2 CONNECTION ORIENTED PROTOCOL OVERVIEW

Connection oriented protocols operate by creating a virtual circuit connection between the communicating entities. Several protocols, including a variation of the IEEE 802.2 Logical Link Control and the venerable X.25 protocol are connection oriented protocols.

In a connection oriented protocol, in order for data to be transferred from the originator to the destination, first a request for a connection must be passed. The destination then passes a connection acceptance confirmation to the originator. At this time data communications between the two entities may begin. When the entire message has been transferred, the connection is closed by one or another of the communicating parties. The connection oriented protocol is analogous to the use of a telephone; the act of dialing a phone may be thought of as a connection request; when a person at the other end picks up the phone and says “Hello,” he is issuing a connection acceptance and confirmation. At this point the actual data communication, the conversation, may take place. Eventually one of the communicating parties says “Good-bye,” issuing a disconnect request. When both parties have hung up, the connection is closed.

B.3 GATEWAY FUNCTION OVERVIEW

There are four different types of relay defined for the OSI reference model; differentiated by the layer at which the relay takes place: the repeater is a relay at the physical layer, a bridge performs the relay function at the data link layer, a router at the network layer and a gateway is a relay at any layer higher than the network layer.[2] In the context of the OSI reference model, an application layer gateway is shown in Figure B2.

[2] John D. Dpragins, et al, *Telecommunications, Protocol and Design* (Reading, MA:Addison-Wesley Publishing, 1991), 491.

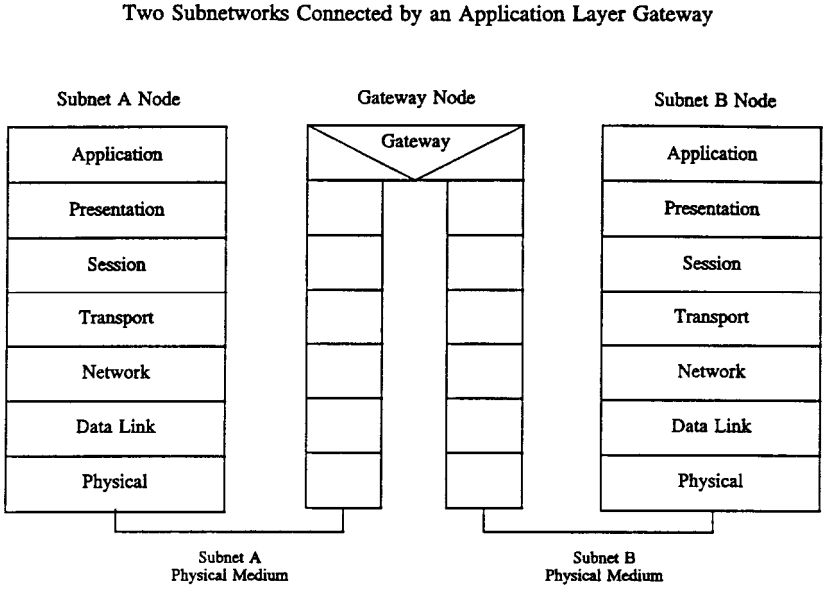


FIGURE B2 - THE GATEWAY MODEL

As the figure implies, the physical media and the protocols used on the two subnetworks may be radically different: subnet A may rely on a local area network such as IEEE 802.3 while subnet B could be based on X.25 using satellite communications. Essentially the gateway accepts messages created and passed on one network, reformulates them into the original application layer format, then uses the services available to it on the other subnetwork to retransmit the message. It is the responsibility of the gateway function to resolve these differences.

It should be noted that a gateway function does not need to exist at the application layer level. The DECnet SNA/DNA gateway protocol is an example of a gateway function at the transport layer level.[3]

B.4 MESSAGE SEGMENTATION AND REASSEMBLY OVERVIEW

A protocol is concerned with exchanging streams of data between two entities. Lower level protocols may need to break the data up into blocks of some smaller bounded size. This process is called segmentation, and its counterpart is called reassembly.[4] This process is shown in Figure B3.

[3] Spragins, 522-523.

[4] William Stalings; *Data and Computer Communications* (New York:MacMillan, 1988), 380.

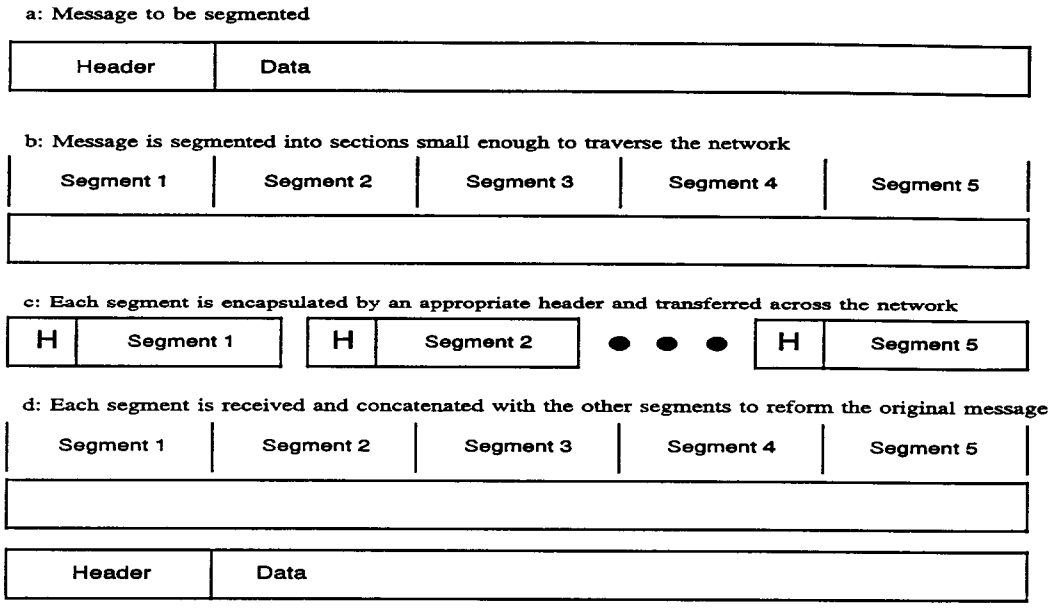


FIGURE B3 - MESSAGE SEGMENTATION AND REASSEMBLY

Fortunately, the function performing the segmentation and the reassembly of the original message does not need to know the internal makeup of the message, its encoding or format. The segmentation/reassembly function may treat the message simply as a stream of bits; all that is required of the segmentation/reassembly function is that the original stream of bits be identical to the stream that is finally received at the destination.

This is assured if the protocol performing the segmentation and reassembly of the message puts a sequence number on each of the segments transmitted. Indeed, the segment number is a vital part of the segmentation/reassembly protocol.

B.5 PID/MESSAGE DEFINITIONS

Any transport protocol for SAE J1587/SAE J1708 communications must be defined in terms of the Message Identifiers (MIDs) and Parameter Identifiers (PIDs) defined in those standards. Two PIDs are defined for the transport protocol: a Connection Management PID (CMP) and a Connection Mode Data Transfer PID (CDP). The CMP will be used for requesting connections, closing connections, message acknowledgments, flow control and for aborting a connection if necessary.

The CDP will be used strictly for the transfer of user data.

B.5.1 Connection Management PID

The CMP provides a mechanism for controlling the transfer of free-form data across the network.

Parameter Data Length: Variable
Data Type: Binary Bit-Mapped
Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: As needed
Message Priority: 8
Format:

PID	Data
197	n a b c1 c2 c3 c4 ...
n—	Byte count of data that follows this character. This excludes characters MID, PID 197, and n but includes a, b, and c type characters
a—	MID of the destination device
b—	Connection Management Control Command identifier
c—	Data dependent on the connection management control value

Connection Management Control Command identifiers may be added to by petitioning the SAE J1587 committee.

B.5.1.1 Connection Management Control Command 1: Request to Send (RTS)

Used by the station wishing to transfer a segmented message to inform the destination station that it wishes to pass data.

DATA Two elements: Total number of segments to be sent, c1, and the number of data bytes in the original complete message, c2 and c3. The number of segments parameter is one byte, the total number of bytes parameter is two bytes (transmitted least significant byte first; i.e., c2 is the least significant byte of the total number of bytes value).

B.5.1.2 Connection Management Control Command 2: Clear to Send (CTS)

Used by the receiving station to inform the originating station that it is ready to receive segmented data and to acknowledge segments already received (or to negative acknowledge (NAK) and re-request segments which were not correctly received).

DATA Two elements: Number of segments the receiver is ready to accept, c1, and the next segment to be transmitted, c2. Note that if the originator has transmitted segment 0 through 8 but segment 6 failed checksum check, a CTS should be sent with the number of segments set to 1 and the next segment set to 6. Upon receipt of a correct section 6, a CTS should be sent with the number of segments set to whatever is acceptable to the receiver and the next segment number set to 9.

B.5.1.3 Connection Management Control Command 3: End of Message Acknowledgment (EOM)

Used by the receiving station to acknowledge receipt of entire message. Note that this is not strictly needed, if all segments have been acknowledged, the entire segmented message has been received.

B.5.1.4 Connection Management Control Command 4: Request for Standardized Data

Used to request certain standardized free-format data.

DATA 2 bytes, c1 and c2. This forms a 2 byte unsigned binary integer with data request assignments (transmitted least significant byte first; i.e., c1 is the least significant byte of the data request assignment):

0	Reserved
1	Trip Recorder Data
2	Driver Log
3	Programmable Parameters
4	Executable Code
5	Calibration Parameters
6-65535	Reserved for future use

B.5.1.5 Connection Management Control Command 255: Abort

Used by either communicating party to abort the connection for any reason.

B.5.2 Connection Mode Data Transfer PID

The CDP is used for the actual transfer of the segmented user data.

Parameter Data Length: Variable
Data Type: Binary Bit-Mapped
Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: As needed
Message Priority: 8
Format:

PID	Data
198	n a b c c c c . . .
n—	Byte count of data that follows this character. This excludes characters MID, PID 198, and n but includes a, b, and c type characters
a—	MID of the destination device
b—	Segment Identification—range from 1 to 255 (segment 0 is not used)
c—	Segment Data—1 to 15 bytes

B.6 PROTOCOL DESCRIPTION

This protocol is particularly appropriate for the transfer of data to/from offboard devices through a gateway device and to/from an onboard system. For example, should a dispatch computer system wish to acquire free form data from an onboard system, the dispatch system would compose a message to the gateway device on the vehicle. This message, whose composition and encoding are outside the scope of SAE J1708/SAE J1587, would command the gateway device to request the data needed. That gateway device would compose a request message to be transferred via the free-form/transport protocol to the final destination device. That device, and only that device, would understand the received free form message to be a request for specific information. The end system device would then use the free-form/transport protocol to pass the requested information to the gateway function. The gateway would then encode the requested data in a format convenient to the gateway-to-dispatch-system link and transmit it to the dispatch system.

B.6.1 Message Segmentation/Reassembly

The transport protocol accepts large messages of 3825 bytes or less. These messages are segmented into 15 byte blocks without regard to the structure of the message or the information encoded. The last segment can be less than 15 bytes as the message length may not be a multiple of 15 bytes. Each of these segments is then assigned a segment number, encapsulated within an SAE J1708 compliant message with a Connection Data Transfer PID; and that message is then transferred to the destination station.

At the receiving end, the messages will be checksum validated. Each message would have the protocol information, that is the MID, the PID, the data length and segment identifier stripped off. The remaining fifteen bytes of data will then be concatenated together to reform the original message. This long message is then passed to an application process. This application level process could be a gateway function if the message is intended for another communications subnet, or it could be used by the onboard system, a terminal display device for instance. The protocol does not place limitations on the data which may be passed using the services of the protocol.

B.6.2 Connection Management Functions

The heart of this protocol is the connection management function. It is this facility that allows for flow control between the sender and the receiver, the capability to acknowledge received message segments without using bandwidth to acknowledge each individual message, and most importantly, the ability to transfer *any* data across the SAE J1587/SAE J1708 data link quickly and reliably.

A connection is by definition not usable for broadcast messages. Only one connection can be supported between any two MIDs at a given time, although there is no reason that a given MID device cannot have connections to two different devices simultaneously. Each connection will be associated with a single MID/MID pair, and all user data transferred across a virtual connection will have a header containing the MID/MID pair with which the connection is associated.

Connection mode data will be passed only at the lowest priority of the network; therefore connection mode data messages may well be interspersed with other, more pressing data on the network. It will be incumbent on the implementation of the protocol to ensure that intervening messages do not disrupt connection mode data and that connection mode data does not disrupt other SAE J1587 message traffic.

B.6.2.1 Request To Send

The transfer of data is initiated by the transmission of a RTS. The RTS contains the number of segments to be transferred by the transport protocol, and the actual size of the message before segmentation. Note that this provides all the information needed for the protocol to reassemble the message correctly.

Upon receipt of an RTS, the receiving station must make decisions concerning its ability to buffer the incoming message. If the receiving station cannot accept any connection mode data it may respond with an ABORT message, signaling that the connection was refused. The receiver may wish to accept the connection request, but may not have any resources available to buffer the message at this moment. In this circumstance the receiver shall respond with a CTS indicating the number of segments to be sent to be zero, starting with segment number zero. As segments are numbered from 1 to 255 (FF_{16}), this indicates to the originator that the receiver is amenable to the connection but is at this moment out of resources. When the resources are available, the receiver should transmit a CTS showing the number of segments it can accept, and a beginning segment ID number of 1.

If a Request to Send is transmitted but no response is received, the originator will wait no fewer than 60 seconds before transmitting a second RTS. At the end of ten unsuccessful attempts to initiate a connection, the originator will declare a connection mode error and cease attempting to initiate the connection.

B.6.2.2 Clear To Send

The CTS is used to respond to RTS messages, to acknowledge received data messages, and to provide flow control between the communicating entities. The CTS data field contains a one-byte field indicating the number of segments that the receiver is capable of buffering and/or interpreting at this time and the segment ID number of the *next* segment it is expecting.

The number of segments to be accepted indicates that the originator may send that many bytes and if they are received across the network, the receiver has the resources to deal with them. If, for example, the receiver has a buffer structure which allows it to hold 4 incoming data messages, it would never send a CTS authorizing the transmission of more than four segments. After processing those four messages, however, the receiver may send a CTS indicating that it can accept four more segments, and that the next segment expected is Segment 5. This is a de facto acknowledgment that segments 1 through 4 were received correctly.

If, on the other hand, the receiver expected to receive segments 1 through 4 and segment 3 was missing, the receiver could transmit a CTS with a number of segments value set to 1 and the next segment ID expected value set to 3.

Flow control is achieved because the two communicating entities collaborate on the amount of data to be sent; bandwidth is conserved because an individual acknowledgment does not have to be transferred for each received data segment, and error control is achieved by the effective re-request of data which was not received properly.

B.6.2.3 End of Message Acknowledgment

The End of Message Acknowledgment is passed by the receiving station once it has received the last segment of a segmented message. It acts as an acknowledgment of the last block of segments which were transferred, an acknowledgment of the entire message, and a signal to close the connection.

B.6.2.4 Connection Abort

The connection abort message may be passed by either of the communicating entities if it cannot continue the data transfer process for any reason.

B.6.3 Connection Mode Data Transfer

Under normal circumstances, the flow model for data transfer follows Figure B4. An RTS is transferred indicating that there are four segments to be transferred for this connection, and that there are 60 bytes in the segmented message.

The receiving station replies with a CTS indicating that it is ready to process two segments, beginning with segment 1.

The originating station passes the first two segments across the network. The receiving station then replies with another CTS indicating that it can take two more segments, beginning with Segment 3. Once segments 3 and 4 have been transferred, the receiving station transmits an EOM message indicating that all the segments expected were transmitted and that the connection is now considered closed.

Message transfer in the event of an error on the link is shown in Figure B5. The RTS is transferred and responded to properly, then data is lost during the data transfer phase.

In this situation, the request to send is sent in the same manner as the earlier example. The first two segments are transferred, but segment two fails checksum, or otherwise was considered in error by the receiving station. The receiver then transfers a CTS indicating that it wants a single segment, and that segment is segment 2. The originator complies, transferring segment 2. The receiver then passes a CTS indicating it wants two segments, starting with segment 3. This CTS is the acknowledgment that segments 1 and 2 were received correctly. Once the last segment is received correctly, the receiver passes an EOM signaling that the entire message has been correctly received.

Connection Mode Data Transfer Sequence

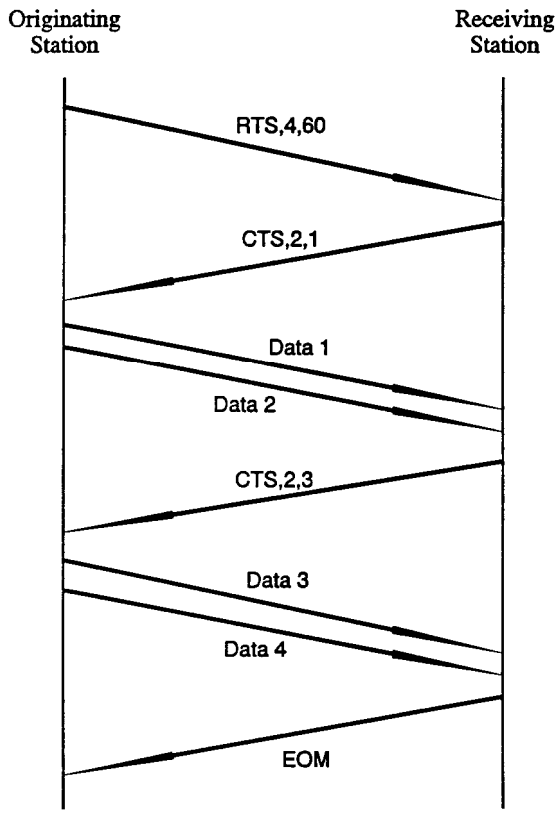


FIGURE B4 - DATA TRANSFER WITHOUT ERRORS

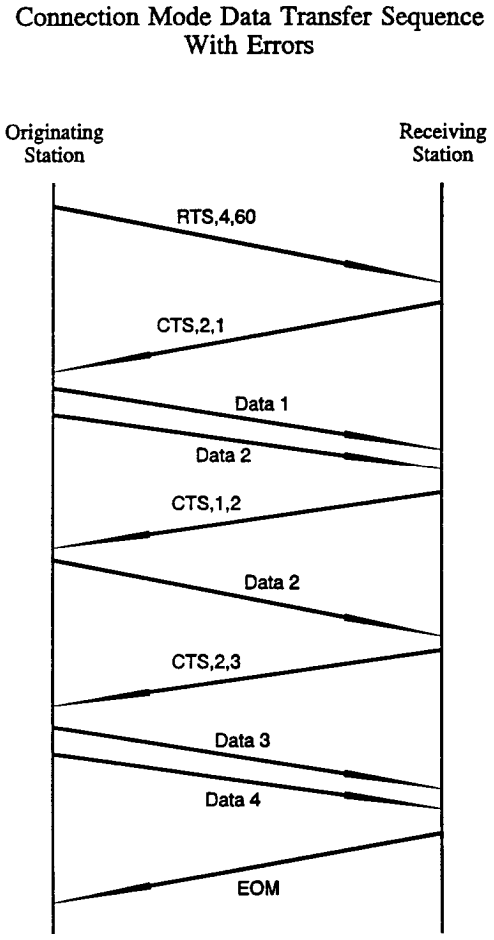


FIGURE B5 - DATA TRANSFER WITH ERRORS

In the situation shown in Figure B6, a station requests that free form data be transferred. It does so by encapsulating the request for data within a free-form message and utilizing the services provided by the transport layer. The other unit receives and interprets the encapsulated request, and uses the services of the transport layer to pass the requested data.

In the situation shown in Figure B7, the requesting device uses the Connection Management Control Command 4 to request standardized data (RSD) as defined by the Committee.

Use of the Transport Protocol for Data Requests

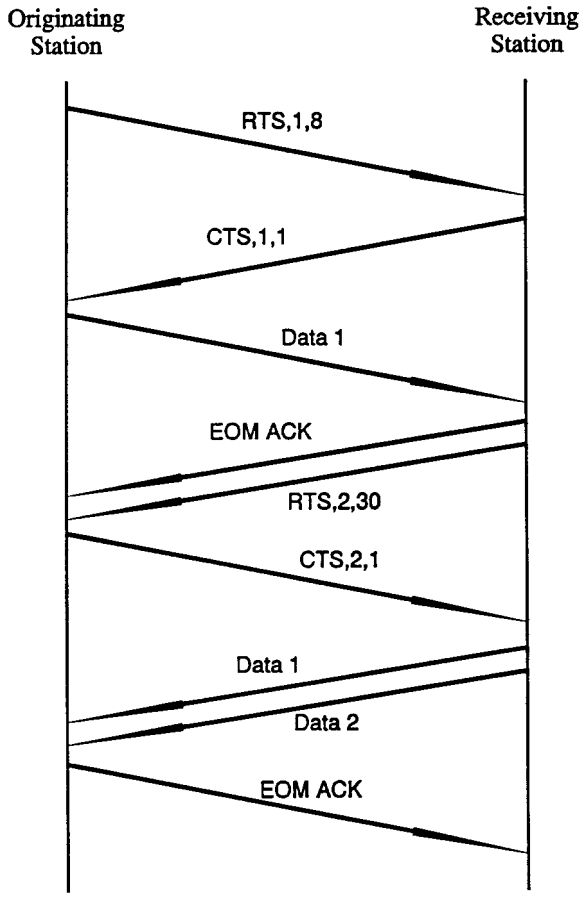


FIGURE B6 - REQUESTED DATA TRANSFER

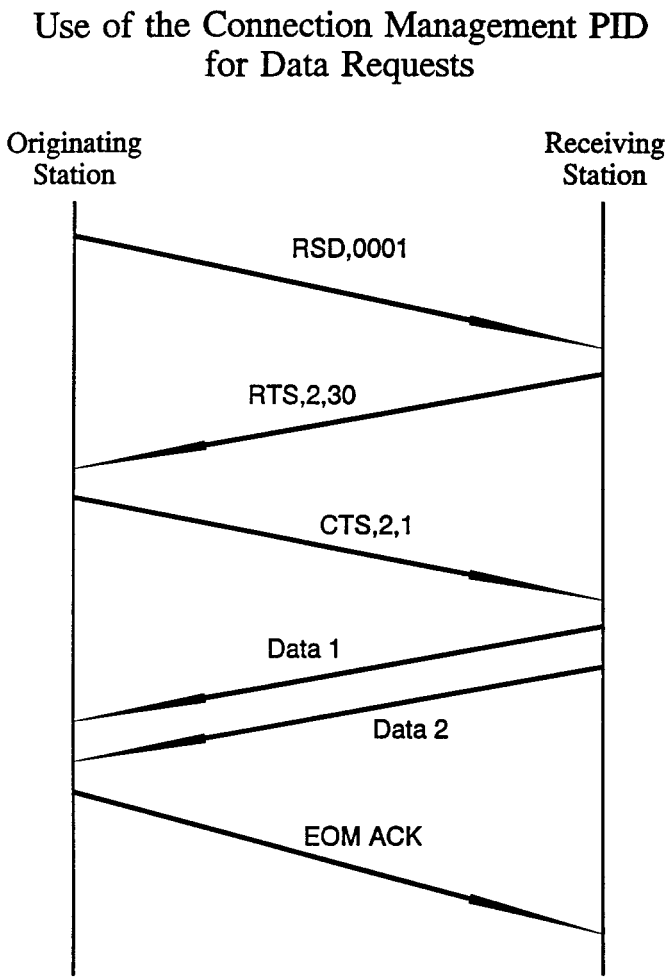


FIGURE B7 - REQUESTED DATA TRANSFER USING THE RSD PARAMETER

APPENDIX C - ELECTRONIC DASH DISPLAY

C.1 INTRODUCTION

Recently, electronics have added additional displays and switches to the driver's workload. For instance, communications equipment has added displays as large as 4 lines by 40 characters, engine display units have added displays of 2 to 4 lines by 20 characters, refrigeration controls have added displays, collision warning systems are adding displays, load weighing electronics are adding displays. Many of these displays are redundant and could be eliminated by displays capable of being used by several electronic controls on the truck.

PIDs 225, 226, and 227 are intended to provide a minimal set of performance guidelines for an optional text message display that can be accessed by several electronic controls on a truck.

C.2 GUIDELINES

A display should be capable of sending and receiving three messages over the SAE J1708/SAE J1587 data link for text messaging:

Text Message Display Type
Text Message to Display
Text Message Acknowledged

C.2.1 Text Message Display Type

This message is sent when power is applied through the ignition switch or when any other electronic control on the truck requests the message. This message is intended to provide the other electronic controls on the truck with information regarding the capabilities of the display device.

The display device provides the information on capabilities so that other controls on the truck can format their information for proper display. The display device can also display common messages yet-to-be defined that are not formatted such as warning messages. However, it is the responsibility of the electronic device wanting to display information on the display device to properly format the information for display. It is not the responsibility of the device display to determine how information should be displayed. However, to minimize the complexity of dealing with different display types, the minimum display size is 1 line by 16 characters. Larger displays should be any number of additional lines and should have more characters in increments of 4 characters. For instance, the next larger display type would be 1 line by 20 characters. Typical display sizes would be 1x16, 2x16, 2x20, 4x20, 4x40.

The display device has the capability to receive and display the information in different languages. The display device informs the sending device to transmit messages in the proper language format. English language is always supported by the display device. Spanish, French, German, and Italian may be supported by the display device. All transmitters must be able to transmit messages in English format. The character set ISO Latin 1 shall be used (see 3.4.2).

A minimum of twenty memory buffers are needed in the display device to handle all possible transmitters (20 transmitters is the SAE J1708 limit) on the network. The minimum buffer size is the same as the maximum display character size.

To provide for consistent display of information and driver interaction, vehicle OEM's or others may provide the display device and additional guidelines for how information is to be displayed on that device. These guidelines will encompass such issues as scrolling of long messages, how to use keys to move through menu trees, how to enter information. The guidelines will be different depending on the capabilities of the display device.

C.2.2 Text Message to Display

This message will allow the display device to receive information to be displayed. The electronic control wanting to display information formats the information in advance and sends this message. For long messages that exceed the size capabilities of the display device, the electronic control will need to follow vehicle OEM or other additional guidelines for breaking up a message into smaller messages or scrolling messages across the display device.

In addition, this message requests one of three acknowledgments from the display device. The display device can acknowledge receipt of the display information immediately upon receipt, after the message has been displayed, or after the message has been displayed and the operator has pressed some key to indicate that he/she has seen the message. The electronic control sending the information determines the type of acknowledgment.

The display device message priority is defined by the type of message to be displayed. If the message requires immediate attention by the driver such as LOW OIL PRESSURE, then the priority would be high, 0 or 1. However, if the message is providing information on some convenience device such as LOW WINDSHIELD WASHER FLUID, then the priority for the message is low, 7 or 8.

If the sending device is transmitting a long, low priority message and then decides to send a higher priority message before it completes its low priority message, an ABORT command can be sent to stop the process. Then the sending device can transmit the higher priority message. Otherwise, the sending device would have to wait until its low priority message is displayed.

C.2.3 Text Message Acknowledged

This message is sent by the display device to the electronic control sending the information to be displayed. The acknowledgment is sent based on what was requested by the electronic control sending the information to be displayed.

C.3 MESSAGE USE

If an electronic control does not receive an acceptable display type response, or receives no response, it must minimize loading on the SAE J1708 data link by not sending "Receive Message to Display" commands.

C.4 DISPLAY GUIDELINES

The manufacturer or provider of a common display must also provide a separate document of guidelines for display of information and interaction with the operator. This document is intended to provide consistent operation of that particular display device by all electronic controls using it. These guidelines would be similar to those provided in the personal computer market for display of information in any of several graphical user interfaces (GUI) or display of information in major computer programs such as word processors, spreadsheets, and databases.

These guidelines will encompass such issues as scrolling of long messages, how to use keys to move through menu trees, and how to enter information. The guidelines will be different depending on the capabilities of the display device.

The manufacturer may also elect to predefine messages for display and uses the text data character portion of the Text Message to Display command to indicate which to display.

C.5 PID/MESSAGE DEFINITIONS

C.5.1 Text Message Display Type

Used to provide other electronic control systems in the truck with information regarding the capabilities of the display type.

Parameter Data Length: 3 Characters
Data Type: Character 1 = Binary bit-mapped
Character 2 = Unsigned Short Integer
Character 3 = Unsigned Short Integer
Resolution: Binary (all characters)
Maximum Range: 0 to 255
Transmission Update Period: Sent once at power up and on request
Message Priority: 8
Format:

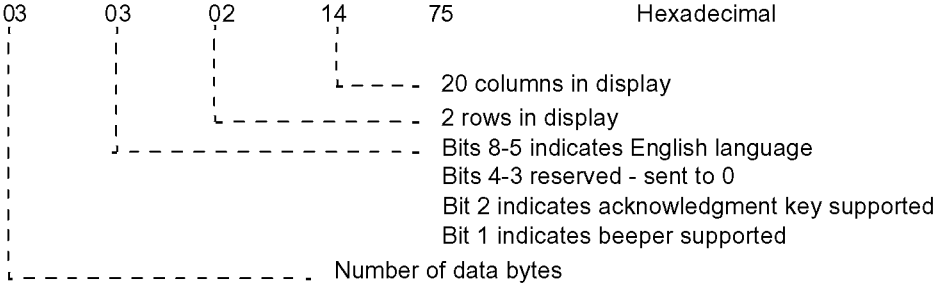
PID Data
227 n a b c
n— Number of parameter data characters = 3
a— Current configuration
Bits 8-5: Language selection
0000—English
0001—Spanish
0010—French
0011—German
0100—Italian
0101-1111—Reserved

NOTE: English must always be supported on display.

Bit 4: Reserved for future expansion—always set to 0
Bit 3: Reserved for future expansion—always set to 0
Bit 2: Acknowledgment key
1 = Acknowledgment key is supported
0 = Acknowledgment key is not supported
Bit 1: Beeper/sound
1 = Beeper is supported
0 = Beeper is not supported
b— Number of rows in the display
c— Number of columns in the display

EXAMPLE: A 2x20 LCD display designed into an instrument panel with beeper and acknowledgment key capability. English is the displayed language.

MID	PID	DATA	DATA	DATA	DATA	CKSUM	
140	227	03	03	02	20	117	Decimal
8c	e3	03	03	02	14	75	Hexadecimal



C.5.2 Text Message to Display

Used to provide the display device information to be displayed.

Parameter Data Length: Variable
Data Type: Character 1-2 = Binary bit-mapped
Character 3-4 = Unsigned Short Integer
Character 5^+ = ASCII
Resolution: Characters 1-4 = Binary
Characters 5^+ = ASCII
Maximum Range: 0 to 255
Transmission Update Period: As needed
Message Priority: 8
Format:

PID	Data
226	n a b c d e e e ...

n— Number of parameter data characters

a— Status character 1

Bit 8: Language selection
1 = Revert to English
0 = Use selected language

Bit 7: Abort message
1 = Abort buffered message
0 = Message OK

Bit 6: Predefined message
1 = Message predefined
0 = Message not predefined

Bit 5: Display complete message
1 = Display buffered message
0 = Continue to buffer message

Bit 4: Sound beeper on display
1 = Initiate beeper (time is set by display device)
0 = No sound

Bit 3: Send acknowledgment upon display of message
1 = Send acknowledgment, must be sent with each section of message
0 = No acknowledgment

NOTE: Sent after message is displayed

Bit 2: Send operator acknowledgment of receipt of message
1 = Expect acknowledgment from operator
0 = Do not expect acknowledgment from operator

NOTE: Sent after operator has acknowledged the message by a keystroke

Bit 1: Send received acknowledgment for each network message (partial display message)
1 = Send acknowledgment for receipt of message
0 = Do not send acknowledgment

NOTE: Sent immediately upon receipt of network message

b— Status character 2
Bits 8-4: Message display time—0 to 31 seconds
Bits 3-1: Message priority—0 to 7

NOTE 1: Priorities 0 and 1 are messages which require immediate attention

NOTE 2: Priorities 2 and 3 are messages which require attention in order to prevent severe mechanical damage

NOTE 3: Priorities 4 and 5 are messages which affect the economical operation of the vehicle

NOTE 4: Priorities 6 and 7 are all other messages

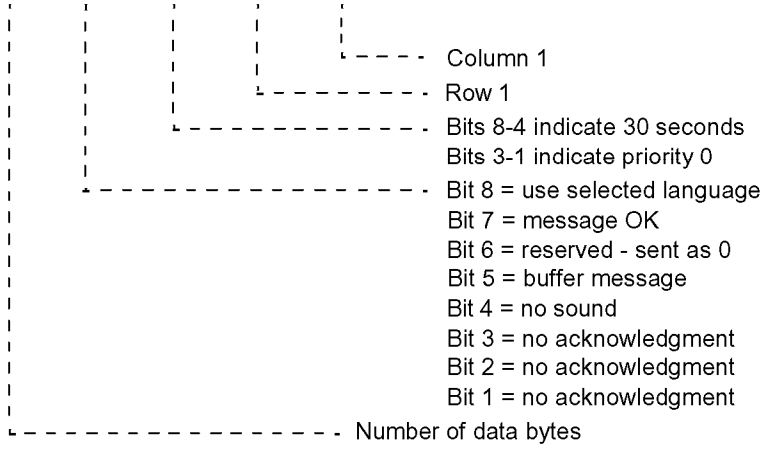
c— Message row/line number—1 to 255 (1 is upper most row)
d— Message column number—1 to 255 (1 is left most column)
e— ASCII text data characters to display

EXAMPLE: Immediately (using priority 0) display the following message coming from the satellite unit on a 2x20 display for 30 seconds with no acknowledgments:

Joe, Call Home.
503 777-7777

First message, first line of display text:

MID	PID	DATA	DATA	DATA	DATA	DATA	DATA	DATA	DATA	
							J	o	e	ASCII
181	226	17	00	240	01	01	74	111	101	Decimal
b5	e2	11	00	f0	01	01	4a	6f	65	Hexadecimal

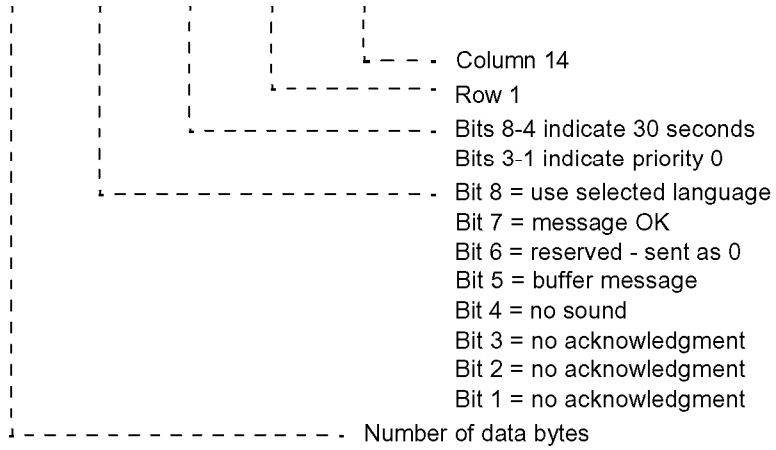


First message, continued:

DATA	DATA	DATA	DATA	DATA	DATA	DATA	DATA	DATA	DATA		
,	<sp>	C	a	l	l	<sp>	h	o	m		ASCII
44	32	67	97	108	108	32	104	111	109	28	Decimal
2c	20	43	61	6c	6c	20	68	6f	6d	1c	Hexadecimal

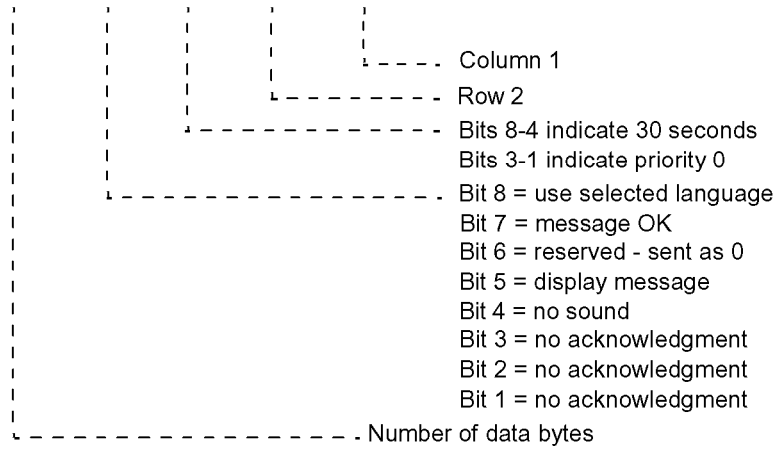
Second message used to complete first line of the display text:

MID	PID	DATA	DATA	DATA	DATA	DATA	DATA	DATA	CKSM	
							e	.		ASCII
181	226	06	00	240	01	14	101	46	209	Decimal
b5	e2	06	00	f0	01	0e	65	2e	d1	Hexadecimal



Third message, second line of display text:

MID	PID	DATA	DATA	DATA	DATA	DATA	DATA	DATA	DATA	
							5	0	3	ASCII
181	226	16	16	240	02	01	53	48	51	Decimal
b5	e2	10	10	f0	02	01	35	30	33	Hexadecimal



Third message, continued:

DATA	DATA	DATA	DATA	DATA	DATA	DATA	DATA	DATA	CKSM	
<sp>	7	7	7	-	7	7	7	7		ASCII
32	55	55	55	45	55	55	55	55	240	Decimal
20	37	37	37	2d	37	37	37	37	f0	Hexadecimal

C.5.3 Text Message Acknowledged

Used to provide an acknowledgment from the display device as requested by the electronic control system sending the information to be displayed, as instructed in status character 1 of the Text Message to Display message (PID 226).

Parameter Data Length: 4 Characters
Data Type: Character 1 = Unsigned Short Integer
Character 2 = Binary bit-mapped
Character 3 = Unsigned Short Integer
Character 4 = Unsigned Short Integer
Resolution: Binary (all characters)
Maximum Range: 0 to 255
Transmission Update Period: As needed
Message Priority: 8
Format:

PID	Data
225	n a b c d

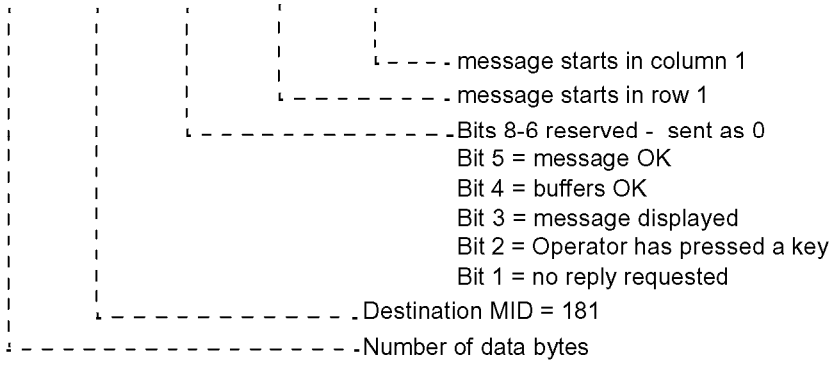
n— Number of parameter data characters = 4
a— MID of transmitter of the Text Message to Display command
b— Display control response
- Bit 8 Reserved for future expansion—set to 0
- Bit 7 Reserved for future expansion—set to 0
- Bit 6 Reserved for future expansion—set to 0
- Bit 5 Message aborted
  - 1 = Message aborted
  - 0 = Message OK
- Bit 4 Display buffer(s) full
  - 1 = Buffer(s) full
  - 0 = Additional messages can be accepted
- Bit 3 Message displayed
  - 1 = Message is being displayed
  - 0 = Message is in buffer
- Bit 2 Operator has pressed an acknowledgment key
  - 1 = Operator acknowledge
  - 0 = No key press
- Bit 1 Receive network message (partial message to display) from sender
  - 1 = Receive network message
  - 0 = No reply requested

c— Message row/line number
d— Message column number

NOTE: Row and column numbers are used to indicate which message is acknowledged or displayed.

EXAMPLE: Acknowledgment from the display that the operator has seen the message from the satellite unit by pressing a key.

MID	PID	DATA	DATA	DATA	DATA	DATA	CKSM	
171	225	04	181	06	01	01	179	Decimal
ab	e1	04	b5	06	01	01	b3	Hexadecimal



APPENDIX D - ELECTRONIC DRIVER INTERFACE UNIT (DIU)

D.1 INTRODUCTION

SAE J1587 has acknowledged different means of allowing the driver of an SAE J1708 equipped vehicle to receive information from devices on the SAE J1708 network. From simple status and warning lamps to character mode displays, there have been assigned several PIDs that would allow a device on the network to send a signal or a message to the driver. However, in order to enable the use of graphics type displays and non-volatile storage of preformatted driver messages, PIDs 498 and 499 have been established. Establishment of these PIDs has enabled the development of Driver Interface Units (DIUs) which employ object oriented protocol for displaying information to the driver.

Object oriented approaches to embedded operator interfaces, especially those employing graphic type displays, like their counterparts in the PC world, can present information in a multidimensional format. That is, the information can be presented textually, in a graphic image, or a combination of text and images.

Simple graphical capabilities like font control, character size, borders around certain pieces of information, and icons representing certain actions or icons representing other devices, can make the information more easily noticed, understood, and internalized by the driver.

Through an object oriented visual presentation of information to the driver, the following objectives can be accomplished: faster comprehension, quicker glances at the display for needed information, segmented information allowing development of strategies for simultaneously displaying messages from multiple devices, and many other improvements in device-to-driver communication.

Object oriented driver interfaces can also support text-only displays. The concept of storing objects and forms within the driver interface unit are the same for graphic and text only displays.

D.2 DEFINITIONS

D.2.1 Object

An object is a single, autonomous entity residing within the non-volatile memory of the driver interface unit. It can be a text object, a beeper object (e.g., a key click), a GPS (Global Positioning System) handler, an icon, a bitmap, or any of a number of autonomous program entities.

D.2.2 Form

A form is a compilation or aggregation of objects that is commonly repeated. One example would be a driver log-on form made up of softkey label objects, a numeric entry object, a beeper object, and control object for accepting the driver's log-in number.

D.2.3 FID

Form Identification number—The catalog number of the stored form.

D.2.4 OID

Object Identification number—The catalog number of the stored object.

D.2.5 DIU

Driver Interface Unit—An operator interface device for a driver, which includes display and keypad, and which employs an object oriented protocol as described in this Appendix.

D.3 GUIDELINES

There are network activities involving the Driver Interface Unit (DIU). In order for the Driver Interface Unit to function, it must be able to send and receive information, which can include the following:

a. Receive a message from other network devices.

b. Broadcast the type of DIU.

c. Monitor the network for important data.

d. Send key press data to other specific network devices.

e. Receive a configuration file download (Object and Form data).

The manufacturer or provider of a DIU device must also provide a separate document of guidelines for display of information, interaction with the driver, and interaction with other network devices, as well as configuration downloading instructions. The guidelines document is intended to provide consistent operation of that particular DIU device.

D.4 PID/MESSAGE DEFINITIONS

D.4.1 Send Keypress Command

Other network devices may require more than an acknowledgment from the DIU. They may require a series of keystrokes. However, there is a requirement that keystrokes be addressed to a specific MID so as not to confuse other network devices. There is an additional requirement that keystrokes be associated with a particular Form ID (FID) since keystrokes of some keys, such as function keys or softkeys, need to be properly identified (since their meaning may change with each displayed form). Only one keystroke per packet is assumed, although up to 14 ASCII characters (also known as a key string) can be sent per keystroke.

Parameter Data Length: Variable
Data Type: Characters 1-2 = Binary bit-mapped
Characters 3^+ = Alphanumeric
Resolution: Characters 1-2 = Binary
Characters 3^+ = ASCII
Maximum Range: 0 to 255
Transmission Update Period: Upon change of status and on request
Message Priority: 6
Format:

PID	Data
498	n a b c c c ...

n— Number of parameter data characters
a— MID of device to receive keystroke data
b— Form ID (FID) of the currently displayed form
c— ASCII character(s) resulting from keystroke (up to 14)

D.4.2 Driver Interface Unit (DIU) Object/Form Command

An object oriented driver interface unit can accept a PID command to display a particular object or form to the driver. The command can be a simple call for a particular canned form or object to be displayed from the DIU memory, with no additional information, e.g., “Low Battery”, or the PID message may cause the display of a particular form or object with additional attribute information appended, for instance, a fuel level or engine temperature value, or a text message sent from the satellite unit. Messages can also contain a command to enable physical objects like the beepers and LEDs, if these features are available on the DIU. Tables D1 through D10 list the details of the structure of PID 499.

Parameter Data Length: Variable
Data Type: Characters 1-2 = Unsigned Short Integer
Character 3 = Unsigned Integer
Characters 4^{+} = Unsigned Short Integer
Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: Upon change of status and on request
Message Priority: 6
Format:

PID	Data
499	n a b c c d1 d2 d3 d4 ...

n— Number of parameter data characters
a— Command type—See Tables D1 and D4
b— Form ID (FID) of the currently displayed form
c— Object ID (OID)—See Tables D2 and D3
d— Data—See Table D4

TABLE D1 - COMMAND TYPE DEFINITIONS

Command	Description
0	Create
1	Delete
2	Write to non-volatile memory
3	Read from non-volatile memory
4	Query object
5	Request display type
6	Object attribute assignment
7	Erase object from screen
8	Paint object to screen
9	DIU control
10	Erase Form from screen
11	Paint Form to screen
12-255	Reserved for assignment by SAE

TABLE D2 - OBJECT IDS

Object ID	Description
0-63	Reserved for Assignment by SAE
64-65535	Proprietary, open for each device manufacturer to define

TABLE D3 - OBJECT CLASSES (EXAMPLES)

Object Class	Description
Message	A text message field, which can be independent of the displayed form, used to display dynamic messages to the operator.
Text	A textual field on a form, having a unique set of attributes.
Key	A handler of key strokes and key strings.
Bitmap	A bitmap field on a form, having a unique set of attributes.
Gauge	A gauge field on a form, having a unique set of attributes.

TABLE D4 - DATA DEFINITIONS (COMMANDS 0 THROUGH 11)

Command	FID	OID	Data	Description
a	b	c	d	
0	1-255	0 (not used)	d1 = 0	Create a new form and give it the FID in field b. A default form always exists and is given FID 0.
0	0-255	0-65535	d1 = 1	Create a messaging object and place it in form FID. The new object gets the OID in field c.
0	0-255	0-65535	d1 = 2	Create a text object and place it in form FID. The new object gets the OID in field c.
0	0-255	0-65535	d1 = 3	Create a key handler object and place it in form FID. The new object gets the OID in field c.
0	0-255	0-65535	d1 = 4	Create a bit mapped object and place it in form FID. The new object gets the OID in field c.
0	0-255	0-65535	d1 = 5	Create a font object and place it in form FID. The new object gets the OID in field c.
0	0-255	0-65535	d1 = 6	Create a gauge object and place it in form FID. The new object gets the OID in field c.
1	1-255	0 (not used)	d1 = 0	Delete the form indicated and all objects contained in that form.
1	1-255	0-65535	d1 = 1	Delete the object indicated.
2	0 (not used)	0 (not used)	0 (not used)	Write all forms and objects from RAM into non-volatile memory.
3	0 (not used)	0 (not used)	0 (not used)	Read all forms and objects from non-volatile memory into RAM.
4	0-255	0-65535	0 (not used)	Query object, requests that the status of the object be returned to the owner device.
5	0 (not used)	0 (not used)	0 (not used)	Request display type (text or graphics) and size (in characters or pixels accordingly.)
6			Object class dependent	See Tables D5 through D10, one for each example object class.
7	1-255	0-65535	0 (not used)	Erase the object from the screen.
8	1-255	0-65535	0 (not used)	Paint the object to the screen.
9	0	0	d1 = 0 d2 = 0-1	Beeper control—0 = off, 1 = on.
9	0	0	d1 = 1 d2 = 0-255	Contrast control—0 = completely light, 255 = completely dark.
9	0	0	d1 = 2 d2 = 0-1	Covert microphone control (for transit buses)—0 = off, 1 = on.
9	0	0	d1 = 3 d2 = 0-3	Back light level—0 = off, 1 = on, 2 = up, 3 = down.
10	1-255	0 (not used)	0 (not used)	Erase the Form from the screen.
11	1-255	0 (not used)	0 (not used)	Paint the Form to the screen.

NOTE: If the CREATE command is used to create new forms, the previously existing forms will be overwritten when a WRITE ALL FORMS command is received by the DIU.

TABLE D5 - MESSAGE OBJECT DATA DEFINITIONS

Command	FID	OID	Data	Description
6	0-255	0-65535	d1 = 0 d2 = 0-2 d3 = 0-2	Alignment—determines where, with respect to the position, the object will be placed. d2—horizontal (0 = left, 1 = middle, 2 = right) d3—vertical (0 = top, 1 = middle, 2 = bottom)
6	0-255	0-65535	d1 =1 d2-dn	Add message—specifies a new message to be added to the list of messages in this object.
6	0-255	0-65535	d1 = 2 d2 = 0-255	Select font—d2 is the Object ID of a font.
6	0-255	0-65535	d1 = 4 d2 = Xlow d3 = Xhigh d4 = Ylow d5 = Yhigh	Set position—set the point that the object will align on. d2 = X position, low byte; d3 = X Position, high byte; d4 = Y Position, low byte; d5 = Y Position, high byte.
6	0-255	0-65535	d1 = 5 d2 = response method d3 = time	Define response type—message is verified in one of the following ways: 0 = operator keypress required, 1 = operator keystroke with time-out, 2 = display message for a fixed time. Time is .2 seconds * d3.
6	0-255	0-65535	d1 = 6 d2 = time	Define flash period—for flashing messages, this number gives the flash time where 1 period = .2 seconds * d2.
6	0-255	0-65535	d1 = 7 d2 = Xlow d3 = Xhigh d4 = Ylow d5 = Yhigh	Define field size—gives the width and height of the field in characters.
6	0-255	0-65535	d1 = 8	Define text attributes—select 0 = normal, 1 = flash

NOTE: Definitions for the action of character d1 apply differently according to the type of object being operated on.

TABLE D6 - TEXT OBJECT DATA DEFINITIONS

Command	FID	OID	Data	Description
6	0-255	0-65535	d1 = 0 d2 = 0-2 d3 = 0-2	Alignment—determines where, with respect to the position, the object will be placed. d2—horizontal (0 = left, 1 = middle, 2 = right) d3—vertical (0 = top, 1 = middle, 2 = bottom)
6	0-255	0-65535	d1 =1 d2-dn	Define text—specifies the text string to be displayed in this field.
6	0-255	0-65535	d1 = 2 d2 = 0-255	Select font—d2 is the Object ID of a font.
6	0-255	0-65535	d1 = 4 d2 = Xlow d3 = Xhigh d4 = Ylow d5 = Yhigh	Set position—set the point that the object will align on. d2 = X Position, low byte; d3 = X Position, high byte; d4 = Y Position, low byte; d5 = Y Position, high byte.
6	0-255	0-65535	d1 = 6 d2 = time	Define flash period—for flashing text, this number gives the flash time where 1 period = 0.2 seconds * d2
6	0-255	0-65535	d1 = 7 d2 = Xlow d3 = Xhigh d4 = Ylow d5 = Yhigh	Define field size—gives the width and height of the field in characters.
6	0-255	0-65535	d1 = 8	Define text attributes—select 0 = normal, 1 = flash

TABLE D7 - KEY OBJECT DATA DEFINITIONS

Command	FID	OID	Data	Description
6	0-255	0-65535	d1 = 1 d2-dn	Define keystring—specifies the string to be sent when the key is pressed.
6	0-255	0-65535	d1 = 4	Select position—specify which "key" on the manual input device will be handled by this object. Note that key translations will depend on which form is currently displayed.

TABLE D8 - BITMAP OBJECT DATA DEFINITIONS

Command	FID	OID	Data	Description
6	0-255	0-65535	d1 = 0 d2 = 0-2 d3 = 0-2	Alignment—determines where, with respect to the position, the object will be placed. d2—horizontal (0 = left, 1 = middle, 2 = right) d3—vertical (0 = top, 1 = middle, 2 = bottom)
6	0-255	0-65535	d1 =1 d2-dn	Define pixels—specifies byte by byte, row by row, the pixels (1 = on, low bit = left-most)
6	0-255	0-65535	d1 = 4 d2 = Xlow d3 = Xhigh d4 = Ylow d5 = Yhigh	Set position—set the point that the object will align on. d2 = X Position, low byte; d3 = X Position, high byte; d4 = Y Position, low byte; d5 = Y Position, high byte.
6	0-255	0-65535	d1 = 7 d2 = Xlow d3 = Xhigh d4 = Ylow d5 = Yhigh	Define field size—gives the width and height of the field in pixels.

TABLE D9 - GAUGE OBJECT DATA DEFINITIONS

Command	FID	OID	Data	Description
6	0-255	0-65535	d1 = 0 d2 = 0-2 d3 = 0-2	Alignment—determines where, with respect to the position, the object will be placed. d2—horizontal (0 = left, 1 = middle, 2 = right) d3—vertical (0 = top, 1 = middle, 2 = bottom)
6	0-255	0-65535	d1 =1 d2 = 0-255	Set value—sets a percentage such that 0 = 0% and 255 = 100%.
6	0-255	0-65535	d1 = 3 d2 = Alow d3 = Ahigh	Set orientation—set the angle that the gauge is painted at. d2 = angle, low byte; d3 = angle, high byte. (0 = horizontal)
6	0-255	0-65535	d1 = 4 d2 = Xlow d3 = Xhigh d4 = Ylow d5 = Yhigh	Set position—set the point that the object will align on. d2 = X Position, low byte; d3 = X Position, high byte; d4 - Y Position, low byte; d5 = Y Position, high byte.
6	0-255	0-65535	d1 = 7 d2 = Xlow d3 = Xhigh d4 = Ylow d5 = Yhigh	Define gauge size—gives the width and height of the gauge in pixels (characters for text displays).

D.4.2.1 Receive DIU Configuration File Download

Objects and forms reside within the non-volatile memory of the DIU. Therefore, there must exist a means of downloading and upgrading this file of objects and forms.

Table D10 describes the command that is used to invoke this transfer. A PID 499 packet with CMD=6 and d1=10 is sent to indicate the beginning of an extended data definition (i.e., a definition for data that will not fit into a single SAE J1708 packet). This packet alerts the DIU that SAE J1587 Transport Protocol will be used to transfer the data. Fields d2-d5 are used to send the total number of bytes that will be transmitted via Transport Protocol, LSB first. The FID and OID of this packet is determined by the manufacturer of the DIU in the case of a complete configuration file download, or is the FID/OID for the specific Form or Object data being downloaded.

The host then initiates a Transport Protocol session by sending a Request To Send to the DIU. The DIU responds with a Clear To Send, and the data portion of the object definition is then transacted per standard Transport Protocol procedure. If the data is larger than 3825 bytes, then multiple consecutive Transport Protocol sessions may be initiated by the host until all data is transmitted.

When all data has been transmitted, the host sends a PID 499 packet with Command=6, FID and OID same as the initiating packet, and a d1 value of 11. This d1 value informs the DIU that all object definition data has been transmitted; it effectively ends the transport protocol session.

Two physical methods of file downloading should exist for any DIU device. First, a factory procedure should enable the manufacturer of the DIU, or OEM of a system which includes a DIU, to load the non-volatile memory with forms and objects for devices on the network. Second, there should exist a procedure by which upgrades can be made in the field, preferably within the vehicle. The structure of PID 499 assumes that configuration download can occur over the SAE J1708 network, using PID 499 with the Transport Protocol, as described previously. Within PID 499, a save command (see Table D4) will indicate that the data will be saved to non-volatile memory, or will not be saved.

TABLE D10 - USING THE TRANSPORT PROTOCOL TO SEND FORM/OBJECT CONFIGURATION DATA TO THE DIU

Command	FID	OID	Data	Description
6	1-255	1-65535	d1 = 10 d2-d5	A transport protocol data transfer will occur next and will be composed of d2-d5 bytes of data.
6	1-255	1-65535	d1 = 11	All data has been transmitted, transport protocol transfer is complete.

APPENDIX E - ANTI-THEFT REQUEST

E.1 ANTI-THEFT REQUEST

The information communicated via this message are end-user based requests to a component. This message is always received by the component, and never sent by the component. The component processes this message and sends out a response message, Anti-Theft Status Report. For the purpose of this specification, 'component' refers to the entity that receives this message, and 'interfacing device' refers to the entity that sends this message.

Parameter Data Length: Variable
Data Type: Binary Bit-Mapped
Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: Transmission of this message is interrupt driven. This message is also transmitted upon power-up of the interfacing device sending this message.
Message Priority: 8
Format:

PID Data
221 n a b c c c c c c c
n— Byte count = 9
a— MID of device to which request is directed
b Status
Bits 8-6: command state machine bit
command _states
000 Add_Password
001 Delete_Password
010 Change_Password
011 Lock_or_Unlock
100 Check_Status
101 Login
110 not defined
111 not defined
Bits 5-4: desired exit mode machine bits
desired_exit_mode
00 Lock_Upon_Operator_Request
01 Lock_When_Key_Off
10 not defined
11 Not_Available
Bits 3-2: encryption_indicator state machine bits
encryption_indicator states
00 Encryption_Seed_Request
01 Encrypted_Code_Present
10 not defined
11 Not_Available
Bit 1: not defined
c— password_representation (this is a 7 byte numeric code generated based on an encryption seed)

E.1.1 Command_States

This parameter is used to identify the specific requests being sent to the component.

E.1.1.1 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.

E.1.1.2 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 E.2.1.3 for limitations.

E.1.1.3 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.

E.1.1.4 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.

E.1.1.5 Check_Status

This state represents a request to check to see if the component is in the Locked or Unlocked state.

E.1.1.6 Login

This state represents a request to validate the end user before performing commands such as Add_Password and Change_Password.

E.1.2 Desired_Exit_Mode

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.

E.1.2.1 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.

E.1.2.2 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).

E.1.2.3 Not_Available

This state indicates that the option is not selectable or changeable by the operator via using current tool.

E.1.3 Encryption_Indicator

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.

E.1.3.1 Encryption_Seed_Request

This state represents a request to the component to provide a random number seed.

E.1.3.2 Encrypted_Code_Present

This state is used to indicate that an encrypted password is being provided to the component.

E.1.3.3 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.

E.1.4 Password_Representation

This parameter is the numeric code (i.e., 'encrypted password' or 'key') that is generated based on (1) the encryption algorithm, (2) the password supplied by the end user, and (3) the random number seed given by the component. For requests or other messages where the Password_Representation parameter is not used, these seven bytes must be transmitted, but will be ignored by the receiver and thus their content does not matter.

E.2 ANTI-THEFT STATUS REPORT

The information communicated via this message is always in response to an Anti-Theft Request message. This message is always sent by the component and never received by the component. This message is the means by which the component gives information and feedback to the end user via the interfacing device.

Parameter Data Length: Variable
Data Type: Binary Bit-Mapped
Resolution: Binary
Maximum Range: 0 to 255
Transmission Update Period: 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.
Message Priority: 8
Format:

PID	Data
222	n a b c c c c c c c c
n—	Byte count = 9
a—	MID of device to which request is directed
b	Status
	bits 8-7: modify password state machine bits
	status_of_request
	00 Ok
	01 'Full_Of_Passwords'
	10 'Empty_Of_Passwords'
	11 Not_Valid
	bits 6-5: engine status state machine bits
	component_status
	00 Unlocked
	01 Locked
	10 Blocked
	11 not defined
	bits 4-3: state machine bits for 'Password_Valid' discrete parameter
	bits 2-1: state machine bits for 'Encryption_Seed_Present' discrete parameter

NOTE: The 'Password_Valid' and 'Encryption_Seed_Present' discrete parameters are defined by the following mode state table:

	discrete parameter states:
	00 False
	01 True
	10 not defined
	11 not defined
c—	Random_Number (a seven byte random numeric code)

E.2.1 Status_of_Request

This parameter is used to indicate whether a 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.

E.2.1.1 Ok

This state indicates that the request was successfully performed.

E.2.1.2 Full_Of_Passwords

This state indicates that the component can NOT store any additional passwords in the memory.

E.2.1.3 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.

E.2.1.4 Not_Valid

This state indicates that the request is not a valid one.

E.2.2 Component_Status

E.2.2.1 Unlocked

This state indicates that the component can be started without the end user being required to enter a password.

E.2.2.2 Locked

This state indicates that the component can NOT be started (i.e., Unlocked) without the end user being required to enter a password.

E.2.2.3 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.

E.2.3 Password_Valid

This parameter indicates if the password is a validated password.

E.2.3.1 False

This state indicates that the password is NOT a validated password.

E.2.3.2 True

This state indicates that the password is a validated password.

E.2.4 Encrypted_Code_Present

E.2.4.1 False

This state indicates that a random number is NOT present.

E.2.4.2 True

This state indicates that a random number is present.

E.2.5 Encryption_Seed

This parameter is a 7-byte numeric code that is pseudorandomly generated. For requests or other messages where the Encryption_Seed parameter is not used, these seven bytes must be transmitted, but will be ignored by the receiver and thus their content does not matter.

Figures E1 through E6 are schematic examples of what data relays between the interfacing device and the component may be like.

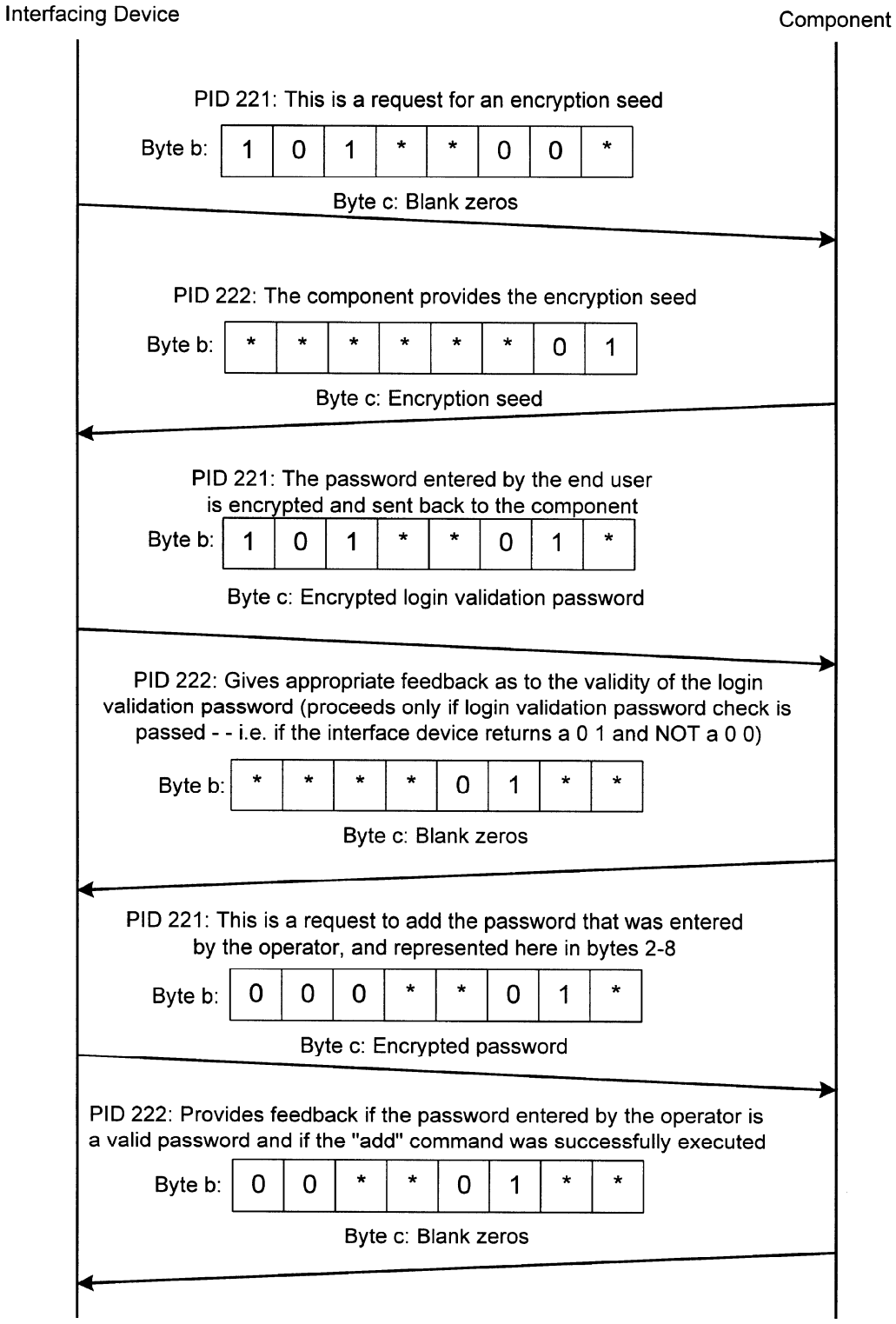


FIGURE E1 - EXAMPLE 1: OPERATOR DESIRES TO ADD A PASSWORD TO THE COMPONENT'S PASSWORD STRUCTURE

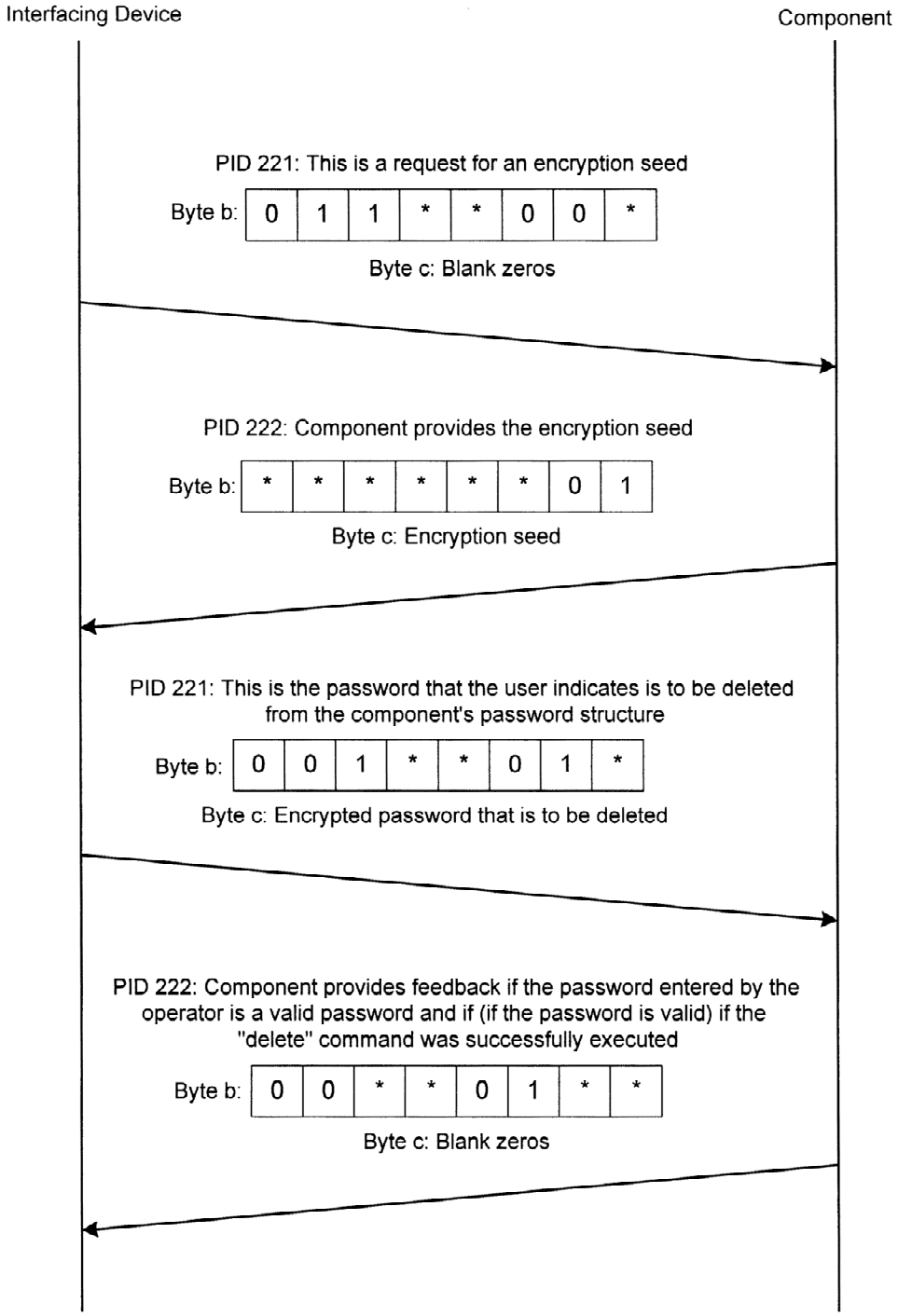


FIGURE E2 - EXAMPLE 2: OPERATOR DESIRES TO DELETE A PASSWORD FROM THE COMPONENT'S PASSWORD STRUCTURE

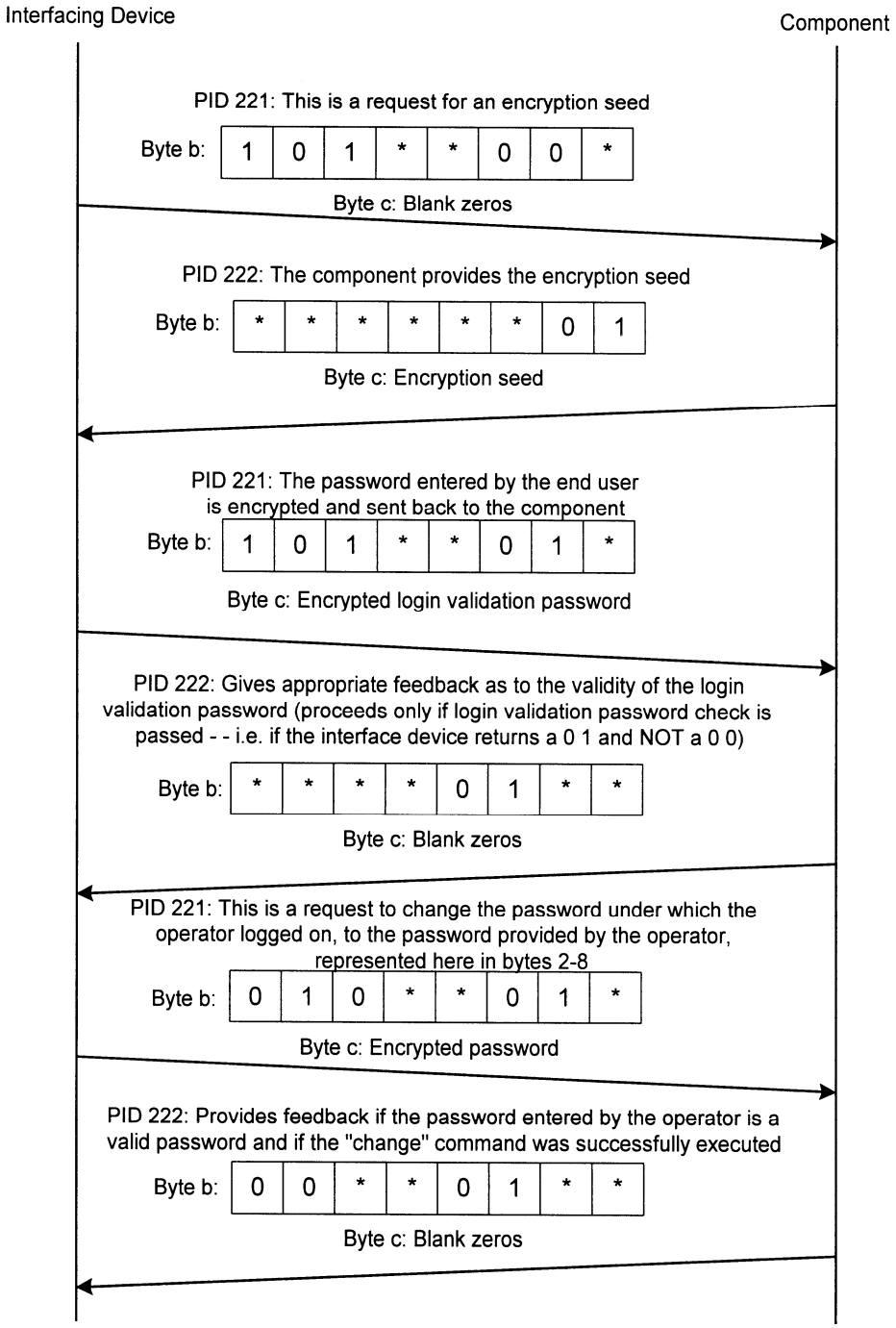


FIGURE E3 - EXAMPLE 3: OPERATOR DESIRES TO CHANGE A PASSWORD WITHIN THE COMPONENT'S PASSWORD STRUCTURE

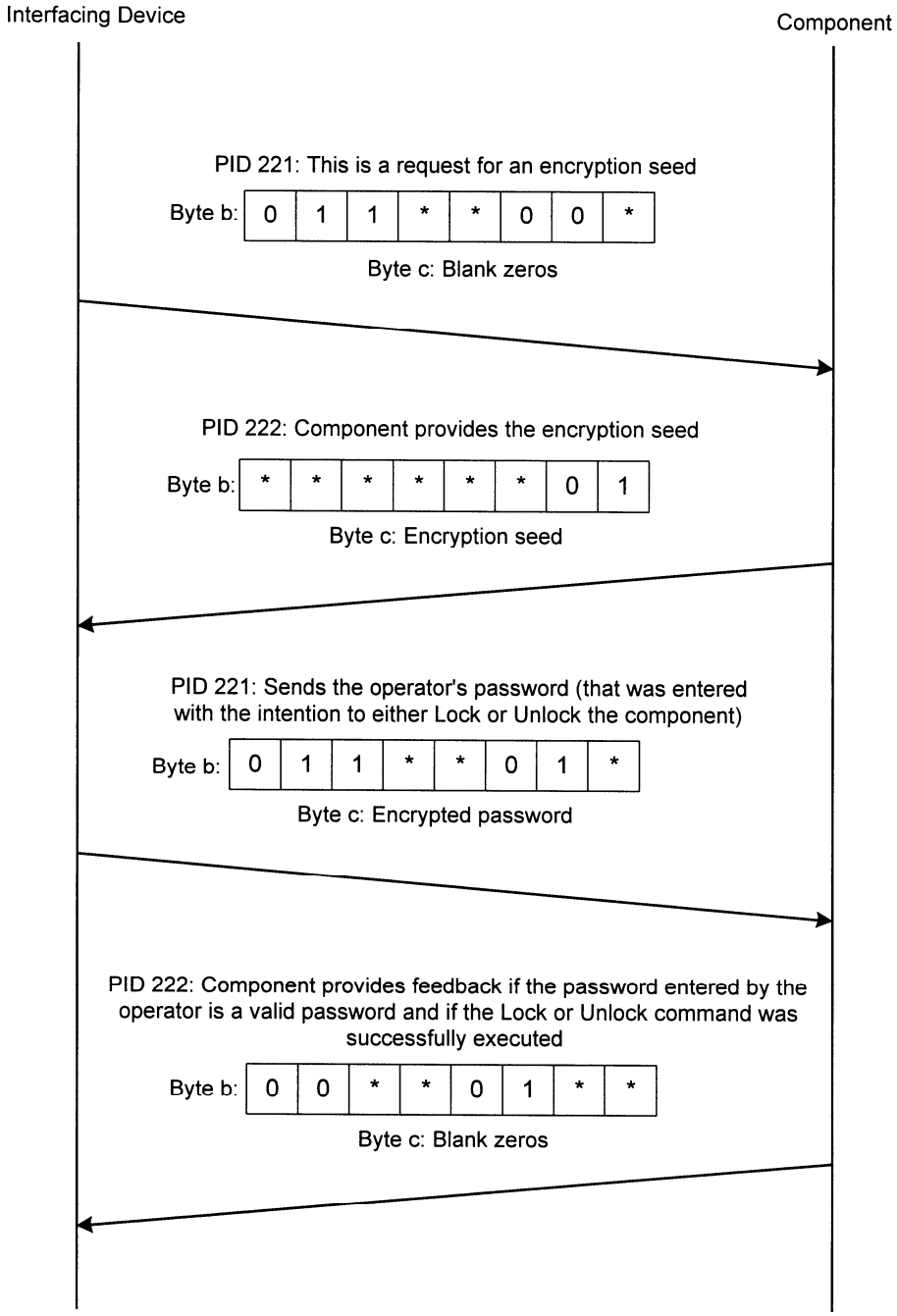


FIGURE E4 - EXAMPLE 4: OPERATOR DESIRES TO LOCK OR UNLOCK THE COMPONENT

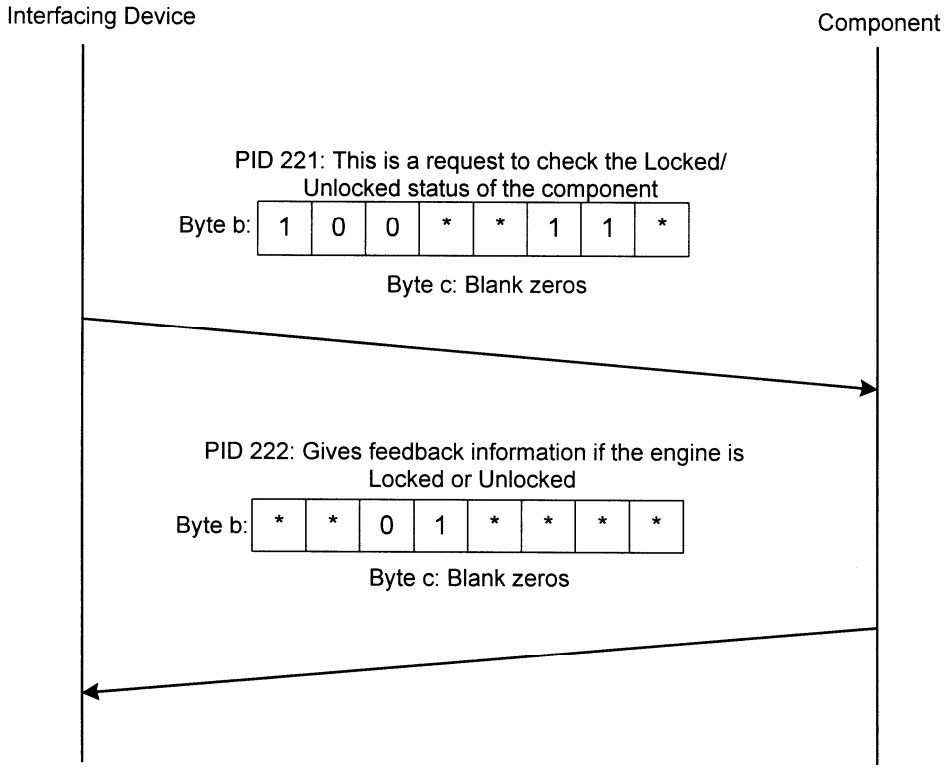


FIGURE E5 - EXAMPLE 5: CHECKING STATUS OF THE COMPONENT

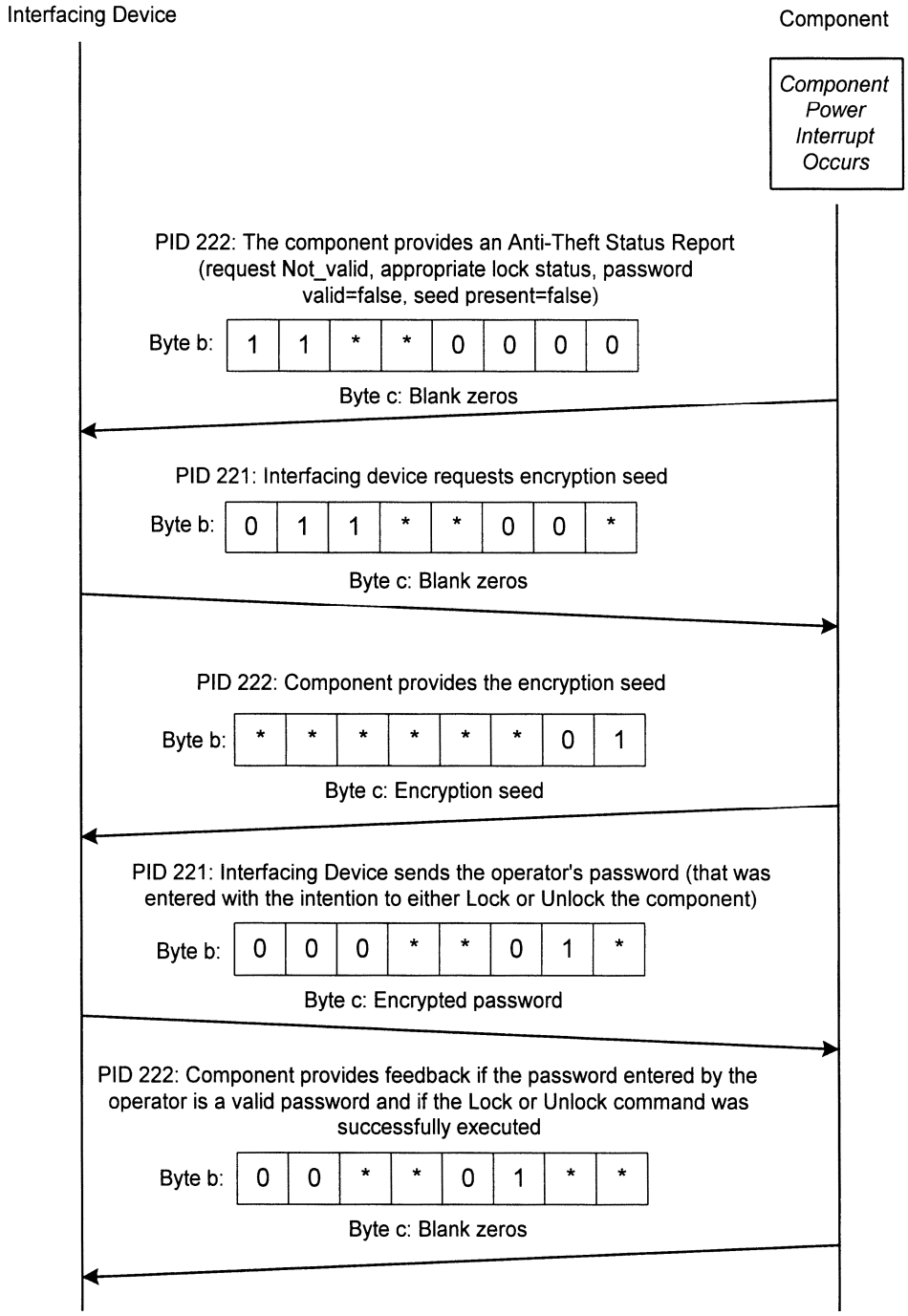


FIGURE E6 - EXAMPLE 6: ABNORMAL COMPONENT POWER INTERRUPTION (INTERFACING DEVICE POWER IS NOT INTERRUPTED)

APPENDIX F - SAE J2497 COMMUNICATIONS VIA SAE J1587 TRANSFER DEVICES

F.1 INTRODUCTION

Communications between devices on the SAE J2497 network and one or more SAE J1587 networks can be achieved by bridging the networks through ECUs functioning as transfer devices (TD) connected by a common SAE J2497 network.

F.2 DEFINITIONS

F.2.1 Originating Device (OD)

The device that originally generates a message containing the data transfer marker PID. The OD can also be the transfer device.

F.2.2 Transfer Device (TD)

A device that sends and receives messages between SAE J1587 and SAE J2497 networks according to this appendix. Only one device shall act as a transfer device on a given SAE J1587 network. The number of independent SAE J1587 networks linked by the SAE J2497 network is not limited.

F.2.3 Source Transfer Device (STD)

The TD that is passing data to the SAE J2497 network from the OD located on a SAE J1587 network.

F.2.4 Destination Transfer Device (DTD)

The TD(s) intended to receive data from the STD or OD on the SAE J2497 network and transfer the data onto a SAE J1587 network.

F.2.5 Data Transfer Marker (DTM)

When the Data Transfer Marker PID is placed in a message, it indicates that the data following the marker is to be transferred between the SAE J2497 network and one or more SAE J1587 networks. This PID contains the MID of the DTD so that messages can be directed to single or multiple SAE J1587 networks. This PID also preserves the MID of the OD so that receiving devices can recognize the OD. TDs will modify the message and checksum as it is passed to another network. DTMs are defined in each parameter page.

F.3 NETWORK MODEL

Example networks are illustrated in Figure F1.

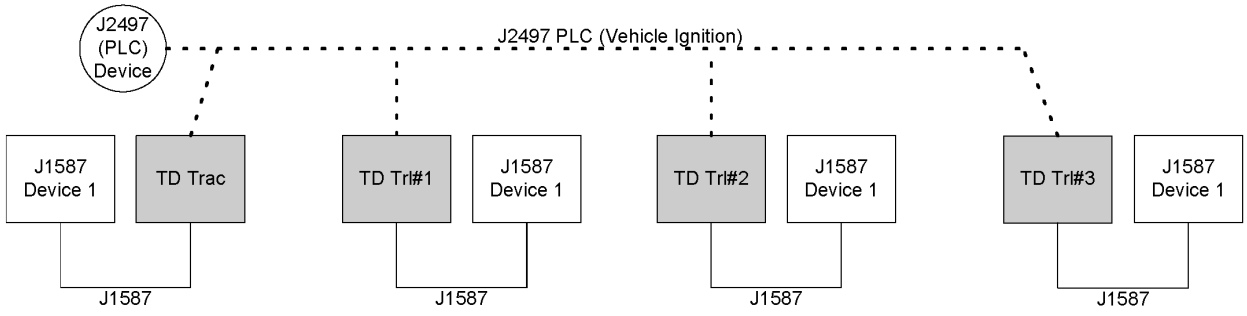


FIGURE F1 - EXAMPLE NETWORK

F.4 DATA TRANSFER MARKER, SAE J1587 / SAE J2497

Indicates that the data following the marker within the message, is to be transferred between the SAE J2497 network and one or more SAE J1587 networks.

PID Numbers: 204 (variable page 1), 460 (variable page 2). Defined all to have the same format.

Parameter Data Length: Variable
Data Type: Unsigned Short Integer (both characters)
Bit Resolution: Binary (both characters)
Maximum Range: 0 to 255 (both character)
Transmission Update Period: as needed
Message Priority: 8
Format:

PID	Data
204	n a b
n—	2
a—	Transfer Data (Source or Destination) If message being sent by OD or STD: 0 = Message is directed to the SAE J2497 network only 1-254 = MID of a specific transfer DTD 255 = Message is directed to all DTDs If message being sent by DTD: 0 = OD was located on SAE J2497 network 1-254 = MID of STD (OD was on SAE J1587) 255 = not defined
b—	Originating Device Data If message being sent by the OD: 0 = Message sent by the OD If message being sent by the STD or DTD: 1-254 = MID of OD 255 = not defined

NOTE 1: Characters ‘a’ and ‘b’ provide routing information. These values are changed by the transfer devices as the message is passed between networks.

NOTE 2: The OD can be located on SAE J1587 or SAE J2497 networks.

NOTE 3: Placing the data transfer marker PID within a message, does not restrict parameters being read by other devices on the local network.

NOTE 4: The TD is only responsible for transposing data that follows the transfer marker and updating the checksum.

NOTE 5: The STD transfers the message only if character b = 0 to avoid message looping.

F.4.1 Priority

The message will be passed with priority of 8. Typically, the priority of the message is that of the highest parameter within the message (See Section 3.5 in SAE J1587). However, this requirement is waived here because this would require significant resources from the transfer device to maintain a PID list as well as effort to search through each message looking for the highest priority PID.

F.4.2 Position in Message

Only information contained in the message after the DTM is to be transferred by the transfer device.

F.4.3 Extension PID Retention

When messages starting with page extension PIDs are received by transfer devices, extension PIDs are retained in the beginning of transferred messages, regardless of the position of the transfer marker PID in the original message.

F.5 MESSAGE CONSTRUCTION AND TRANSFORMATION

F.5.1 Originating Device

A device on a SAE J1587 or SAE J2497 network that needs to send a message to another network through a transfer device, will perform the following steps:

(Starting the message using the MID of the OD)

1. Include the transfer marker in the message, in front of the data to be transferred.
2. Place the MID of the DTD in character a.
3. Place 0 in character b.

F.5.2 Source Transfer Device

When the STD receives a message from an OD, it will perform the following steps:

(Starting the message using the MID of the STD)

1. Place OD MID in character b
2. Recalculate the check sum (discard all data preceding the Data Transfer Marker PID)
3. Place the message onto the SAE J2497 network.

F.5.3 Destination Transfer Device

When the DTD receives a message from an OD or STD, it will perform the following steps:

(Starting the message using the MID of the DTD)

1. Place the MID STD or zero in character a.
2. If OD was located on SAE J2497, place MID OD in character B, otherwise no change to character B.
3. Recalculate the check sum (discard all data preceding the Data Transfer Marker PID)
4. Place the message onto the SAE J1587 network.

F.6 TRANSPORT PIDS 192 AND 198

This appendix does not define support for these parameters at this time.

F.7 MESSAGE VERIFICATION

TDs are not required to report message errors. The TDs capacity to buffer multiple messages is design dependent. Refer to manufacturer’s specification.

F.8 INDICATION OF PRESENT DEVICES

Devices or functions present on the bus will only be determined by the reception of a message from that device or function. If the reception of a periodic message is not detected according to the defined update rate, it is to be assumed that the device sending the message is no longer present, i.e. the trailer has been disconnected.

F.9 PAGE 1 MESSAGE TRANSFORMATION EXAMPLES

F.9.1 Tractor SAE J1587 Device Sends Message to all Trailer SAE J1587 Networks

Message #1

Engine #1 (MID 128) transmits a message on SAE J1587 with PID 204 (Page 1 Data Transfer Marker PID) in front of PID 9 to be transferred to all trailers.

Device	MID	PID	DATA	PID (DTM)	n	DATA	DATA	PID	DATA	CKSM
Engine #1 (OD)	128	100	127	204	2	255	0	9	240	215

Decimal

Message #2

Tractor transfer device receives the message on SAE J1587, modifies PID 204, restructures message with transferable data only, recalculates checksum, and places the following message on SAE J2497.

NOTE: The PID 100 message was not included in the new message because it was placed ahead of the transfer marker PID in the original message.

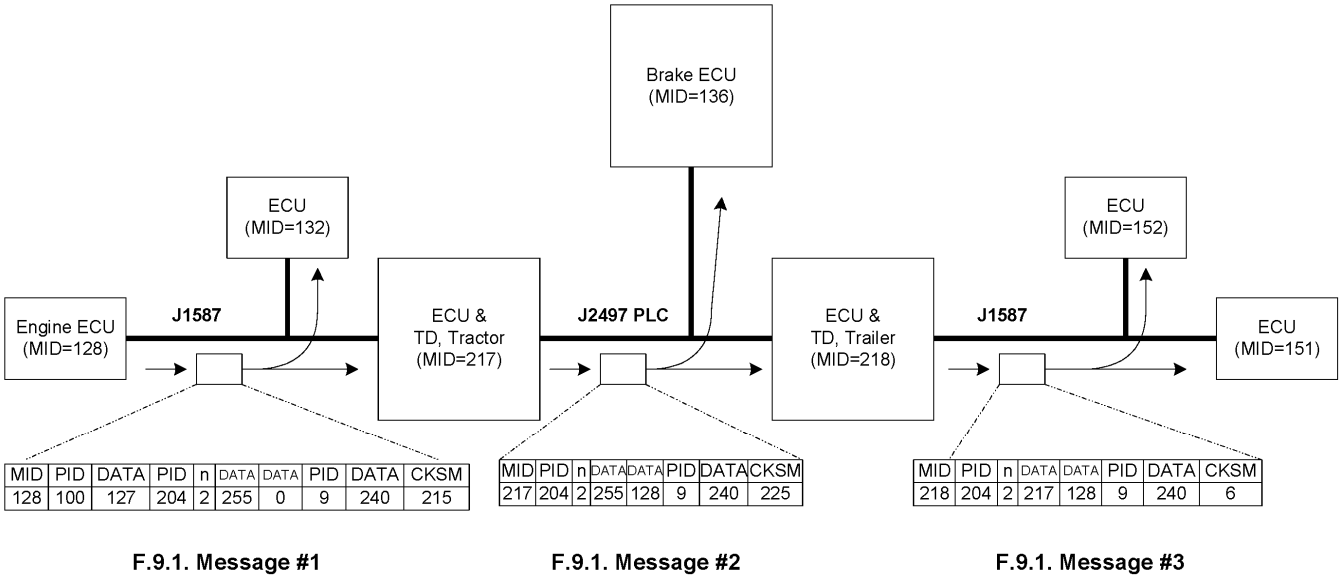
Device	MID	PID (DTM)	n	DATA	DATA	PID	DATA	CKSM	
TD, Tractor (STD)	217	204	2	255	128	9	240	225	Decimal

Message #3

All trailer mounted transfer devices receive the message on SAE J2497. (Trailer #1 example shown.)

Trailer #1 transfer device receives the message on SAE J2497, modifies PID 204, restructures message with transferable data only, recalculates checksum, and places the following message on SAE J1587.

Device	MID	PID (DTM)	n	DATA	DATA	PID	DATA	CKSM	
TD, Trailer #1 (DTD)	218	204	2	217	128	9	240	6	Decimal



F.9.1. Message #1 **F.9.1. Message #2** **F.9.1. Message #3**

FIGURE F2 - MESSAGE TRANSFER OF PAGE 1 PID FROM TRACTOR TO TRAILER (F.9.1)

F.9.2 Trailer SAE J1587 Device Sends Message to Tractor SAE J1587 Network Only

Message #1

Suspension, Trailer creates a message with PID 204 in front of data to be transferred to the tractor only, and places the following message on SAE J1587.

Device	MID	PID (DTM)	n	DATA	DATA	PID	DATA	CKSM	
Suspension, Trailer (OD)	151	204	2	217	0	9	240	201	Decimal

Message #2

Trailer #1 transfer device receives the message on SAE J1587, modifies PID 204, restructures message with transferable data only, recalculates checksum, and places the following message on SAE J2497.

Device	MID	PID (DTM)	n	DATA	DATA	PID	DATA	CKSM	
TD, Trailer #1 (STD)	218	204	2	217	151	9	240	239	Decimal

Message #3

Tractor transfer device receives the message on SAE J2497, modifies PID 204, restructures message with transferable data only, recalculates checksum, and places the following message on SAE J1587.

Device	MID	PID (DTM)	n	DATA	DATA	PID	DATA	CKSM	
TD, Tractor (DTD)	217	204	2	218	151	9	240	239	Decimal

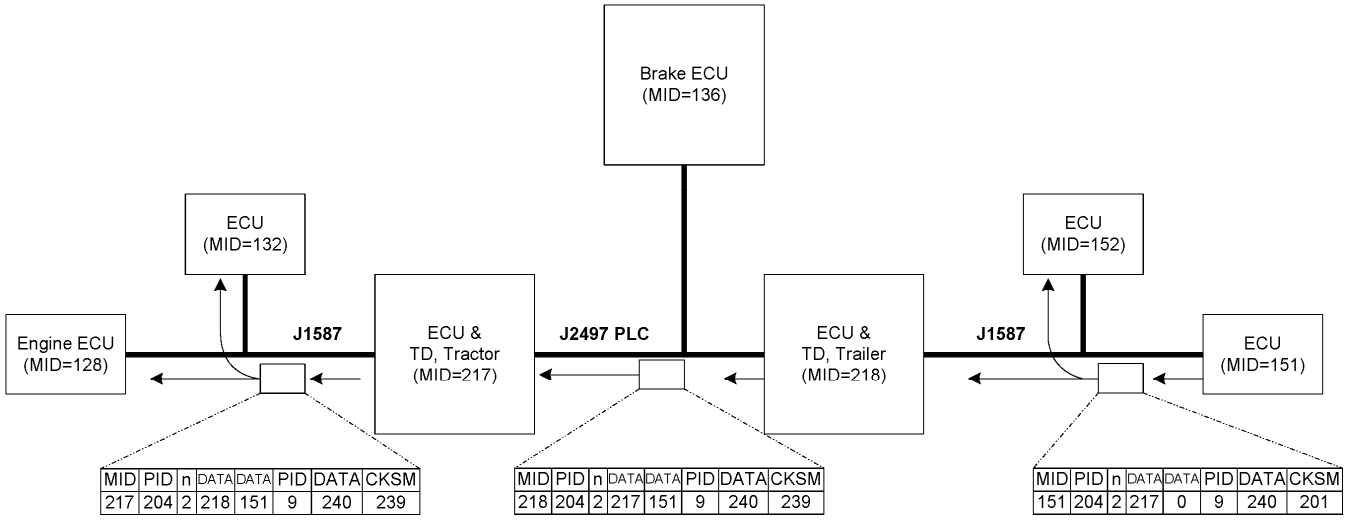


FIGURE F3 - MESSAGE TRANSFER OF PAGE 1 PID FROM TRAILER TO TRACTOR (F.9.2)

F.9.3 SAE J2497 Device Sends Message to Trailer #1 SAE J1587 Network Only

Message #1

Brakes, Power Unit creates a message with PID 204 in front of data to be transferred to Trailer #1 only, and places the following message on SAE J2497.

Device	MID	PID (DTM)	n	DATA	DATA	PID	DATA	CKSM	
Brakes, Power Unit (OD)	136	204	2	218	0	49	22	137	Decimal

Message #2

Trailer #1 transfer device receives message on SAE J2497, modifies PID 204, restructures message with transferable data only, recalculates checksum, and places the following message on SAE J1587.

Device	MID	PID (DTM)	n	DATA	DATA	PID	DATA	CKSM	
TD, Trailer #1 (DTD)	218	204	2	0	136	49	22	137	Decimal

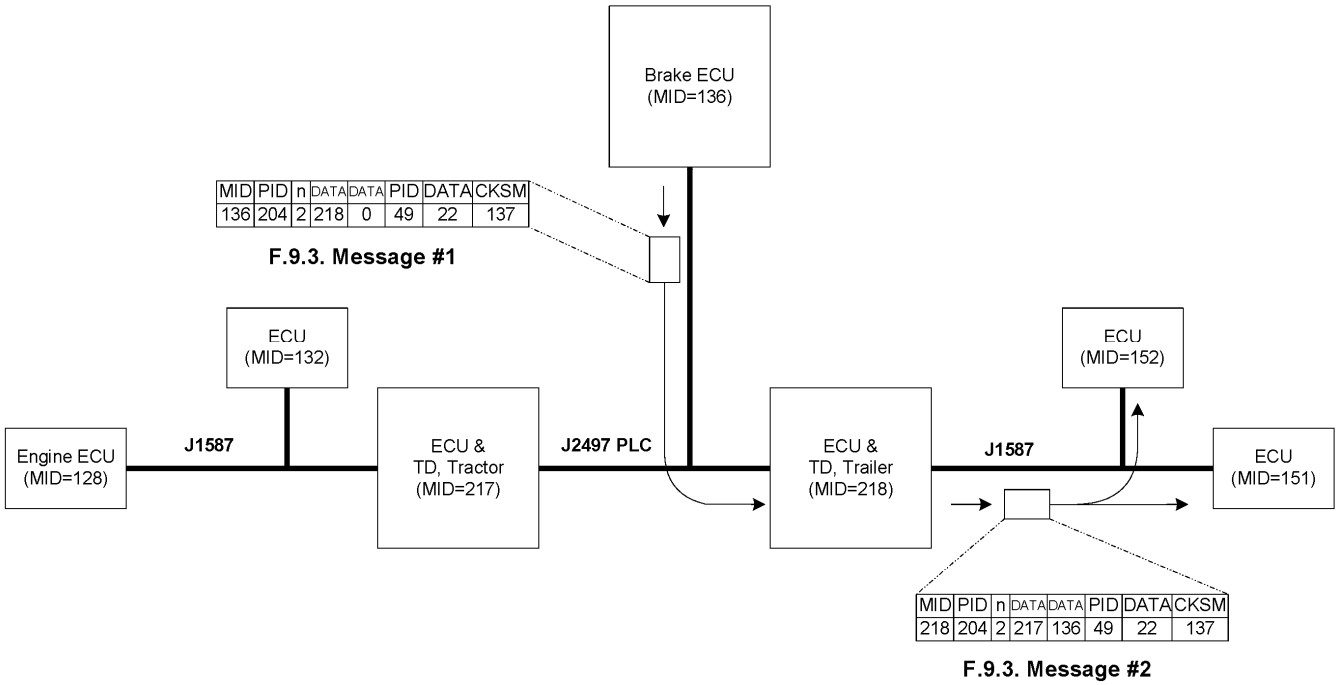


FIGURE F4 - MESSAGE TRANSFER OF PAGE 1 PID FROM SAE J2497 DEVICE TO SAE J1587 TRAILER #1 (F.9.3)

F.10 PAGE 2 MESSAGE TRANSFORMATION EXAMPLES

F.10.1 Tractor SAE J1587 Device Sends Message with Page 2 PID to all Trailer SAE J1587 Networks

Message #1

Engine #1 (MID 128) transmits a message on SAE J1587 with PID 460 (Page 2 Data Transfer Marker, PID 204 on Page 2) in front of the PID request for PID 379 (PID 123 on Page 2) to transfer this request to all trailers.

NOTE: The Data Page marker (PID 255) is before the Data Transfer Marker PID and the Request PID.

Device	MID	PID	PID (DTM)	n	DATA	DATA	PID	DATA	CKSM
Engine #1 (OD)	128	255	204	2	255	0	0	123	57

Message #2

The Tractor transfer device (MID 217) receives the message on SAE J1587, modifies PID 460, restructures message with transferable data only, recalculates checksum, and places the following message on SAE J2497.

NOTE: The Data Page marker (PID 255) is before the Data Transfer Marker PID and the Request PID.

Device	MID	PID	PID (DTM)	n	DATA	DATA	PID	DATA	CKSM
TD, Tractor	217	255	204	2	255	128	0	123	96

Message #3
All trailer mounted transfer devices receive the message on SAE J2497. (Trailer #1 example shown.)

The Trailer #1 transfer device (MID 218) receives the message on SAE J2497, modifies PID 460, restructures message with transferable data only, recalculates checksum, and places the following message on SAE J1587.

NOTE: The Data Page marker (PID 255) is before the Data Transfer Marker PID and the Request PID.

Device	MID	PID	PID (DTM)	n	DATA	DATA	PID	DATA	CKSM
TD, Trailer	218	255	204	2	217	128	0	123	133

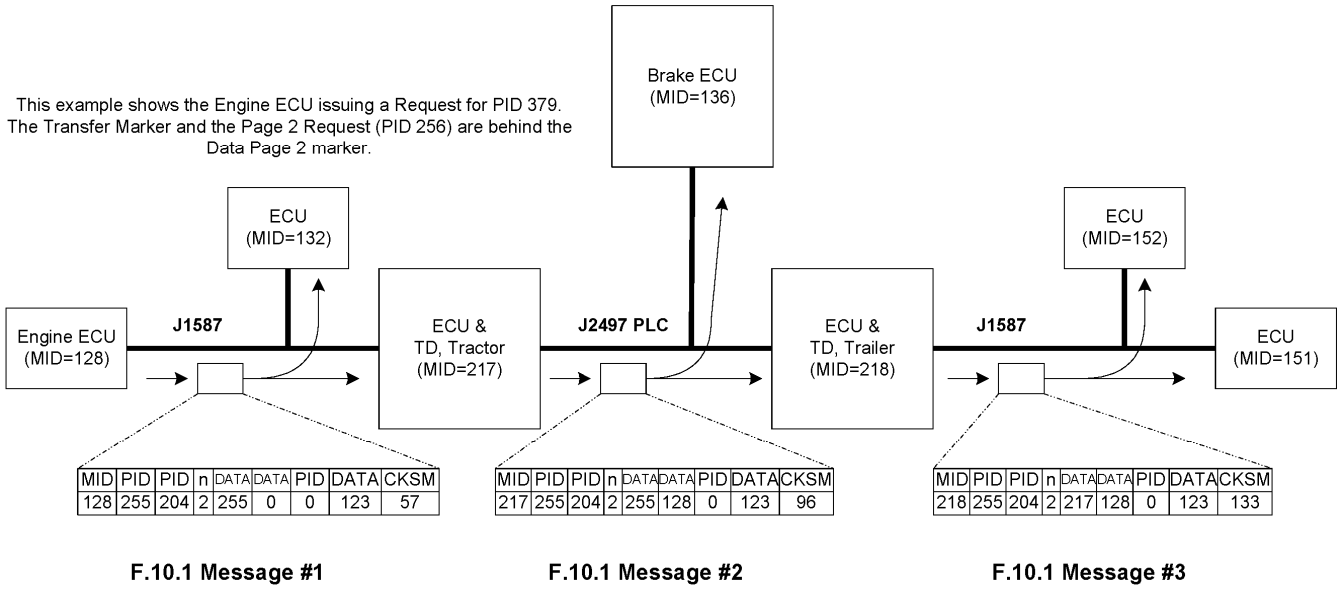


FIGURE F5 - MESSAGE TRANSFER OF PAGE 2 PID FROM SAE J1587 TRACTOR TO SAE J1587 TRAILER (F.10.1)

F.10.2 Trailer SAE J1587 Device Sends Message with Page 2 PID to Tractor SAE J1587 Network

Message #1
Upon receiving the PID 379 request, the Trailer Suspension (MID 151) transmits a message on SAE J1587 with PID 460 in front of the PID 379 data response to transfer the PID 379 data to the tractor only.

NOTE: The Data Page marker (PID 255) is before the Data Transfer Marker PID and the requested PID.

Device	MID	PID	PID (DTM)	n	DATA	DATA	PID	DATA	CKSM
Suspension, Trailer	151	255	204	2	217	0	123	243	85

Message #2

The Trailer #1 transfer device (MID 218) receives the message on SAE J1587, modifies PID 460, restructures message with transferable data only, recalculates checksum, and places the following message on SAE J2497. Note that the Data Page marker (PID 255) is before the Data Transfer Marker PID and the requested PID.

Device	MID	PID	PID (DTM)	n	DATA	DATA	PID	DATA	CKSM
TD, Trailer	218	255	204	2	217	151	123	243	123

Message #3

The Tractor transfer device (MID 217) receives the message on SAE J2497, modifies PID 460, restructures message with transferable data only, recalculates checksum, and places the following message on SAE J1587.

NOTE: The Data Page marker (PID 255) is before the Data Transfer Marker PID and the requested PID.

Device	MID	PID	PID (DTM)	n	DATA	DATA	PID	DATA	CKSM
TD, Tractor	217	255	204	2	218	151	123	243	123

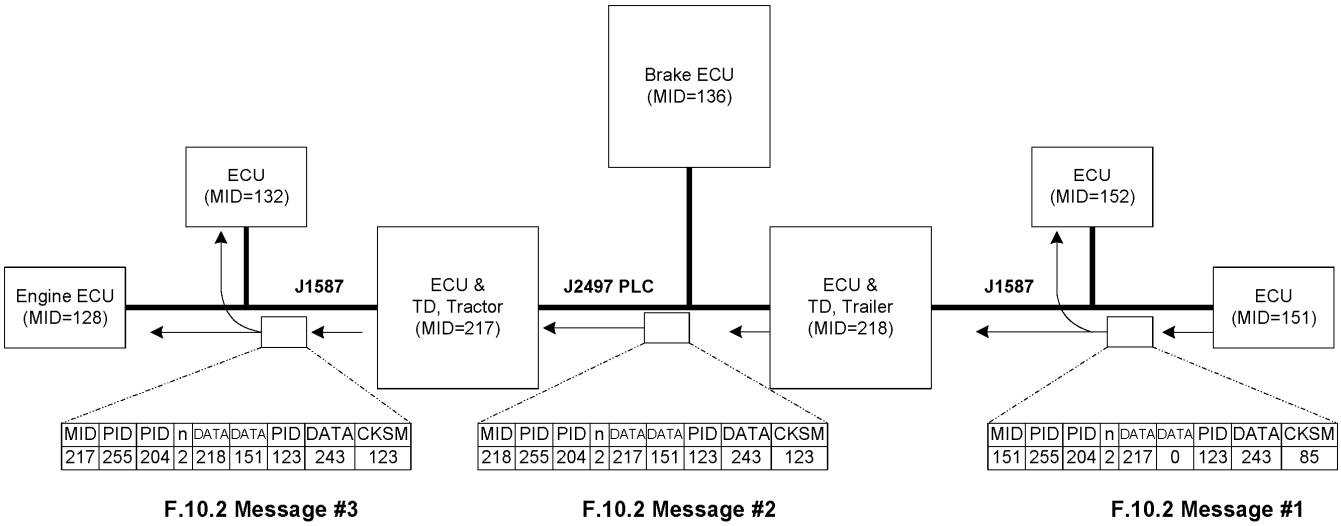


FIGURE F6 - MESSAGE TRANSFER OF PAGE 2 PID FROM SAE J1587 TRAILER TO SAE J1587 TRACTOR (F.10.2)

APPENDIX G - FEB2002 VERSION OF TABLE 1

G.1 The Feb2002 version of Table 1 has been preserved in Appendix G for reference only. This preserved version of the Message Identification Assignment Table reflects the last published version of the table before the partitioning of MID assignments by transportation industry segment and the associated restructuring of Table 1, as described in 3.2.1 through 3.2.1.4 of this document.

TABLE G1 - MESSAGE ID ASSIGNMENT LIST

MID #	
0-127	Defined by SAE J1708
128	Engine #1
129	Turbocharger
130	Transmission
131	Power Takeoff
132	Axle, Power Unit
133	Axle, Trailer #1
134	Axle, Trailer #2
135	Axle, Trailer #3
136	Brakes, Power Unit
137	Brakes, Trailer #1
138	Brakes, Trailer #2
139	Brakes, Trailer #3
140	Instrument Cluster
141	Trip Recorder
142	Vehicle Management System
143	Fuel System
144	Cruise Control
145	Road Speed Indicator
146	Cab Climate Control
147	Cargo Refrigeration/Heating, Trailer #1
148	Cargo Refrigeration/Heating, Trailer #2
149	Cargo Refrigeration/Heating, Trailer #3
150	Suspension, Power Unit
151	Suspension, Trailer #1
152	Suspension, Trailer #2
153	Suspension, Trailer #3
154	Diagnostic Systems, Power Unit
155	Diagnostic Systems, Trailer #1
156	Diagnostic Systems, Trailer #2
157	Diagnostic Systems, Trailer #3
158	Electrical Charging System
159	Proximity Detector, Front
160	Proximity Detector, Rear
161	Aerodynamic Control Unit
162	Vehicle Navigation Unit
163	Vehicle Security
164	Multiplex
165	Communication Unit—Ground

TABLE G1 - MESSAGE ID ASSIGNMENT LIST (CONTINUED)

MID #	
166	Tires, Power Unit
167	Tires, Trailer #1
168	Tires, Trailer #2
169	Tires, Trailer #3
170	Electrical
171	Driver Information Center
172	Off-board Diagnostics #1
173	Engine Retarder
174	Cranking/Starting System
175	Engine #2
176	Transmission, Additional
177	Particulate Trap System
178	Vehicle Sensors to Data Converter
179	Data Logging Computer
180	Off-board Diagnostics #2
181	Communication Unit—Satellite
182	Off-board Programming Station
183	Engine #3
184	Engine #4
185	Engine #5
186	Engine #6
187	Vehicle Control Head Unit/Vehicle Management System #2
188	Vehicle Logic Control Unit/Vehicle Management System #3
189	Vehicle Head Signs
190	Refrigerant Management Protection and Diagnostics
191	Vehicle Location Unit—Differential Correction
192	Front Door Status Unit
193	Middle Door Status Unit
194	Rear Door Status Unit
195	Annunciator Unit
196	Fare Collection Unit
197	Passenger Counter Unit #1
198	Schedule Adherence Unit
199	Route Adherence Unit
200	Environment Monitor Unit/Auxiliary Cab Climate Control
201	Vehicle Status Points Monitor Unit
202	High Speed Communications Unit
203	Mobile Data Terminal Unit
204	Vehicle Proximity, Right Side
205	Vehicle Proximity, Left Side
206	Base Unit (Radio Gateway to Fixed End)
207	Bridge from SAE J1708 Drivetrain Link
208	Maintenance Printer
209	Vehicle Turntable
210	Bus Chassis Identification Unit
211	Smart Card Terminal

TABLE G1 - MESSAGE ID ASSIGNMENT LIST (CONTINUED)

MID #	
212	Mobile Data Terminal
213	Vehicle Control Head Touch Screen
214	Silent Alarm Unit
215	Surveillance Microphone
216	Lighting Control Administrator Unit
217	Tractor/Trailer Bridge, Tractor Mounted
218	Tractor/Trailer Bridge, Trailer Mounted
219	Collision Avoidance Systems
220	Tachograph
221	Driver Information Center #2
222	Driveline Retarder
223	Transmission Shift Console—Primary
224	Parking Heater
225	Weighing System, Axle Group #1/Vehicle
226	Weighing System, Axle Group #2
227	Weighing System, Axle Group #3
228	Weighing System, Axle Group #4
229	Weighing System, Axle Group #5
230	Weighing System, Axle Group #6
231	Communication Unit—Cellular
232	Safety Restraint System
233	Intersection Preemption Emitter
234	Instrument Cluster #2
235	Engine Oil Control System
236	Entry Assist Control #1
237	Entry Assist Control #2
238	Idle Adjust System
239	Passenger Counter Unit #2
240	Passenger Counter Unit #3
241	Fuel Tank Monitor
242	Axles, Trailer #4
243	Axles, Trailer #5
244	Diagnostic Systems, Trailer #4
245	Diagnostic Systems, Trailer #5
246	Brakes, Trailer #4
247	Brakes, Trailer #5
248	Forward Road Image Processor
249	Body Controller
250	Steering Column Unit
251-255	Reserved to be assigned