SCOPE OF APPLICATION **Non-Premium Cars**	기술 표준 ENGINEERING STANDARD	SHT/SHTS **1 / 624**
ESTABLISHED **Mechatronics Development Team**	ENGINEERING SPECIFICATION	SPEC No. **ES95480-00**

TITLE:

High Speed CAN Specification for P/T & Chassis Control Units

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##		2nd Draft (V1.6.2) - Add WHL_PUL message - Add 7 signals in FATC message - Add cruise pattern in CF_Tcu_ShfPatt - Add CR_Tcu_ShiftTq signal - Modify CruiseSWStatus/CruiseSW_Main signal definition - Add CruiseSWStatus/CruiseSW_Main receiver : EMS - Add CF_Clu_AliveCnt2 signal - Add ESS_STAT, CF_Clu_HazardSW	17,18,21,23,26,27,35, 37,51,87,94,97~99,235, 285,297,324,325,443, 451~457,510,517	'09,02,24	JH.KIM
$$		3rd Draft (V1.6.3) - Add MDPS2/SPAS1 messages	18,19,23~26,401~406, 527~531	'09,03,31	JH.KIM
%%		4th Draft (V1.6.4) - Modify Range of OBD Diag. Tools ID - Add ObjDisappearing, GoNotify, StopReq, MainMode_ACC, DriverAlert - Add SCC2, SCC3, EPB1, WHL_SPD, ESP4, LDWS1 - Add AliveCounter_TCS1, Checksum_TCS1, AliveCounter, Byte0Parity, CF_Ems_AclAct - Add CF_Clu_SldMainSW - Deleate CF_Clu_TripInf, CF_Clu_DispInf - Modify CAN Transceiver - Add Receiver : 4WD,SPAS,EPB,LDWS - Modifty Timeout : During the Engine cranking time - Modify CR_Tcu_ShiftTq : Unit, Bit length - Modify R_TqAcnApvC : Max. range - Add Message : SPAS2, YRS3, VSM1/2 - Add CF_Esc_LimoInfo - Add Receiver : FATC - Add CF_Ems_HPresStat	12,16~32,34,35,39,42, 49~51,57~59,94,96~98, 104~106,113,118~121, 124,136,137,140,142, 163,166,172,173,181, 190~192,197~199,206, 212,218,279~283,286, 287,290~292,301, 303~332,334~337,339, 345,348,350,353,370, 448,471~477,488~499, 505~513,527,580~591, 598,606~624	'09,04,29	JH.KIM

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1. Introduction

1.1 Scope

This document describes a high speed (500kbps) CAN communication specification of non-Premium cars for the data exchange between the powertrain, chassis controllers and other ECUs including

1) Engine Management System (EMS)
2) LPG Injection System (LPI)
3) Anti-Lock Brake System (ABS)
4) Traction Control System (TCS) or Electronic Stability Controller (ESC)
5) Steering Wheel Angle Sensor (SAS)
6) Transmission Control Unit (TCU)
7) 4-Wheel Drive Control Unit (4WD)
8) Smart Cruise Control System (SCC),
9) Dashboard (cluster) Unit (CLU),
10) Adaptive Front Lighting System (AFLS)
11) Instant Glow Start System (ISS)
12) Tire Pressure Monitoring System (TPMS)
13) Rotary Electronic Actuator (REA)
14) Electornic Control Suspention System (ECS)
15) Motor Driven Power Steering (MDPS)
16) Yaw Rate Sensor (YRS)
17) Full Automatic Temperature Control System (FATC)
18) Air Bag Control Unit (ACU)
19) Occupant Detection System (ODS)
20) Mozen Telematics System (MTS)
21) Car Ubiquitous System (CUbiS)
22) Rear Parking Assist System (RPAS)
23) Double Clutch T/M (DCT)
24) Smart Parking Assist System (SPAS)

Using High-Speed (Class-C) Controller Area Network (CAN).

1.2 Normative Referencies

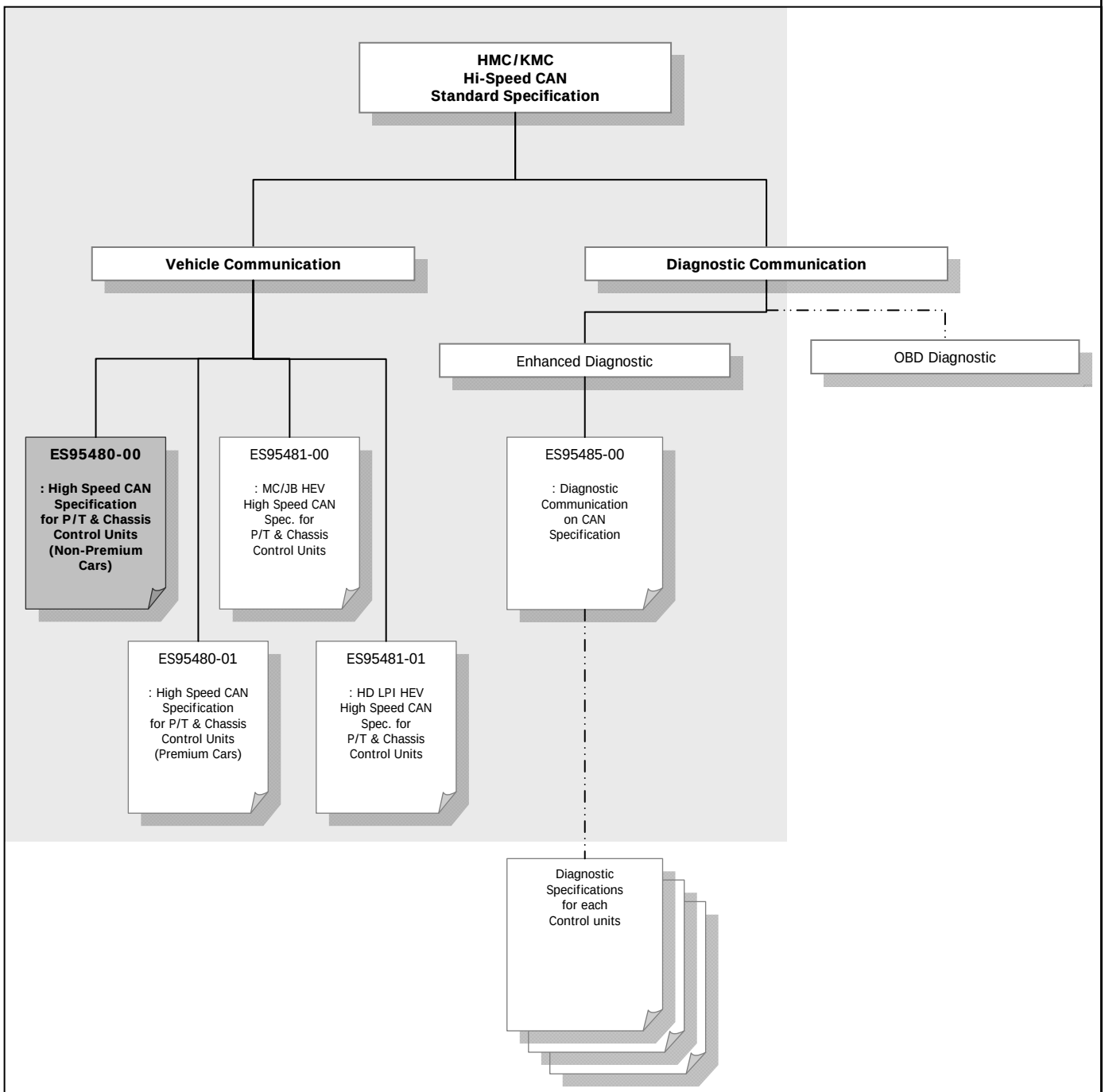
SAE J2284 – 3 : 2002	High-Speed CAN(HSC) for Vehicle Applications at 500 KBPS
ISO 11898 – 1 : 2003	Road-Vehicles – Controller Area Network (CAN) – Part 1 : Data link layer and physical signaling
ISO 11898 – 2 : 2003	Road-Vehicles – Controller Area Network (CAN) – Part 2 : High-speed medium access unit
ISO 11898 – 5 : 2007	Road-Vehicles – Controller Area Network (CAN) – Part 5 : High-speed medium access unit with low-power mode
ISO 15765-3 : 2004	Road vehicles — Diagnostics on Controller Area Networks (CAN) - Part 3 : Implementation of unified diagnostic services
ES 95485-00 :	HMC/KMC Engineering Standard – Diagnostic Communication on CAN Specification

1.3 Document Structure

The standard specification is the general specifications establishing the communications concept. For a given controller, it is possible that not everything in the standard specifications will apply.

The device specification (each controller specific) would contains :

- References to the optional parts of standard specifications that are applicable to the controller.
- Specific information (e.g. signals and messages) received and transmitted by that controller.



2. CAN Hardware Interface

2.1 General Features

1) Serial asynchronous bus system
2) Multi master system
3) Bus access by message priority realized by non-destructive bit-wise arbitration.
4) Maximum bus transfer rate up to 1 Mbit/s (This document specify transfer rate as 500kbps)
5) Message related data transfer, 2032 different message types (standard frame format with 11 identifier bits)
6) Maximum cable length of 30m
7) According to ISO 11898 the maximum number of nodes is 30
8) The message length depends on the data size (maximum of 8 bytes)
9) The latency time depends on the transfer rate and the priority of the respective message
10) Its identifier fixes the priority of a message
11) Powerful error detection and handling. Every controller checks the received message.
12) Local error detection to recognize own errors of the transmitting controller
13) Automatic retransmission of corrupted messages as soon the bus is idle again
14) Distinction between temporary errors and permanent failures of nodes and autonomous switching-off (Bus-Off) of defect nodes to ensure the stability of the whole system.

2.2 CAN Controller

Protocol Version (Bosch CAN Specification)	Full CAN Feature	Basic CAN Feature	Number of Communication Messages	
			Basic CAN	Full CAN
V2.0 B active	YES	YES	1	up to 15

2.3 CAN Data Frame Format

The standard frame format with 11 identifier bits is used for the communication between the ECU and other control units. For more details, see Bosch CAN Specification V2.0B.

Inter-frame space	← DATA FRAME, Number of bits →										Inter-frame space
≥3	1	11	1	6	0..8byte	15	1	1	1	7	≥3
	Start of frame	IDENTIFIER	RTR bit	CONTROL	DATA	CRC sequence	CRC delimiter	ACK slot	ACK delimiter	End of frame	

Abbreviations:

RTR	Remote Transmission Request
CRC	Cyclic Redundancy Code
ACK	Acknowledge

2.4 CAN Hardware Interface Description

Pin assignment for CAN:

CAN_H	High side switch
CAN_L	Low side switch
CAN_GND	Ground (for shielding)

<u>DC parameter for the RECESSIVE state:</u>

Recessive bus state						
Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Bus voltage output behavior	V_{CAN_H} V_{CAN_L}	2.0 2.0	2.5 2.5	3.0 3.0	V	no load
differential voltage output behavior	V_{diff}	-500	0	50	mV	no load
differential internal resistor	R_{diff}	10		100	kΩ	DC, no load 1)
internal resistor 4)	R_{in}	5		50	kΩ	DC, no load
differential voltage input behavior 2)	V_{diff}	-1.0		0.5	V	load 60Ω 1) 3)

Table 1. DC parameter at recessive state

DC parameter for the DOMINANT state:

Dominant bus state						
Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Bus voltage output behavior	V_{CAN_H} V_{CAN_L}	2.75 0.5	3.5 1.5	4.5 2.25	V	load 60Ω 1)
differential voltage output behavior	V_{diff}	1.5	2.0	3.0	V	load 60Ω 1)
differential voltage input behavior 2)	V_{diff}	0.9		5.0	V	Load 60Ω 1) 3)

Table 2. DC parameter at dominant state

Notes to DC parameters:

1) The load is connected between CAN_H and CAN_L. The normal load for the CAN bus is a 60Ω resistor (2x120Ω, parallel connection). For an ECU t without integrated bus termination resistor (120Ω), R_{diff} is seen as internal resistor when the controller is disconnected from the bus line.
   For an ECU with integrated bus termination resistor, the 120Ω resistor is seen instead of R_{diff} when the ECU is disconnected from the bus line.
2) The threshold for receiving the dominant and recessive bits ensures a noise immunity of 0.3V and 0.5V.
3) Reception must be ensured within the common mode voltage range, defined in Table 4 and Table 5.
4) R_{in} of CAN_H and CAN_L should have the same value. The deviation has to be less than 3% relative to each other.

AC parameters of CAN node:

AC parameters of CAN node disconnected from bus						
Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Bit time	t_B	1990	2000	2010	ns	
Internal capacitance	C_{in}	-		100	pF	
Differential internal capacitance[2)]	C_{diff}	-		50	pF	

Table 3. AC parameters of CAN node disconnected from bus

Common mode voltages:

The following parameters apply when all ECU's (2 to 30) are connected to a correctly terminated bus line.

Recessive bus state						
Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Common mode voltage on the bus line	V_{CAN_H} V_{CAN_L}	 -2.0	2.5 2.5	7.0	V	Measured with respect to the individual ground of each ECU
differential bus voltage	V_{diff}	-120	0	12	mV	Measured at each ECU connected the bus line

Table 4. Bus voltage at recessive state

Dominant bus state						
Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Common mode voltage on the bus	V_{CAN_H} V_{CAN_L}	 -2.0	3.5 1.5	7.0	V	Measured with respect to the individual ground of each ECU
differential bus voltage 1)	V_{diff}	1.2	2.0	3.0	V	Measured at each ECU connected to the bus line

Table 5. Bus voltage at dominant state

Notes to common mode voltages:

1) The bus-load increases when ECU's are added to the bus line, because of R_{diff}. Consequently, V_{diff} decreases. The minimum value of V_{diff} determines the number of ECU's allowed on the bus. The maximum value of V_{diff} must not exceed 3V.

Maximum ratings of V_{CAN_L} and V_{CAN_H}:

Maximum ratings of V_{CAN_L} and V_{CAN_H} of CAN node			
Nominal battery voltage (V)	Symbol	Voltage[1] (V)	
		Min	Max
12	V_{CAN_H}	-3.0	16.0
	V_{CAN_L}	-3.0	16.0

Table 6. Maximum ratings of V_{CAN_L} and V_{CAN_H}

Notes to Maximum ratings of V_{CAN_L} and V_{CAN_H}:

1) Undisturbed operation does not have to be guaranteed, but no destruction of bus driver circuit and no time limit.

Dynamic characteristics:

Transmitter dynamic characteristics						
Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Differential output slew rate	SR	20		40	V/μs	R_L=60Ω C_L=50pF

Table 7. Voltage Slew Rate

Communication Reliability Voltage:
This means that all ECU should transfer the reliable message below battery voltage condition.

CAN communication reliability voltage						
Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Battery voltage condition	VB	9.0	-	16.0	V	

Table 8. Communication Reliability Voltage

Notes to Communication Start Voltage:
1) All ECUs should start to communicate below 8V.
@@
Notes to Voltage Range with DTC recording:
1) All ECUs have to be diagnosed some faults in the range that is defined by Communication Reliability Voltage.

Connector parameters:

Connector parameters					
Parameter	Symbol	Min	Typ	Max	Unit
Voltage V_{BAT} = 12 V	U	-	-	16	V
Current	I	0	25	80	mA
Peak current	I_P	-	-	500	mA
Transmission resistance	R_T	-	70	100	mΩ

Table 9. Connector parameters

2.5 Bus Interface

2.5.1 CAN Transceiver

%%
~~The following transceivers, which fulfill ISO 11898, can be used as transceiver: Instead of following transceivers, any transceiver can be used which its attributes are same with followings.~~

~~Name~~	~~Supplier~~
~~TLE6250G~~	~~Infineon~~
~~TJA1050~~	~~Philips~~
~~TJA1040~~	~~Philips~~
~~PCA82C250~~	~~Philips~~

~~Table 10. Bus Transceivers~~

The bus transceiver is the interface between the CAN controller and the physical signal lines CAN_{High} and CAN_{Low}. High Speed CAN transceivers that are compliant to the ISO11898-2 [ISO2] and ISO11898-5 [ISO5] specification have to be used.
Bus transceivers are allowed as well, if they

1. have passed the conformance test according to [ICTTS]
2. have an approved EMC according to [ICTEMC]

Minor deviations can be accepted after an individual examination.

* References to General Documents
[ICTEMC] GIFT/ICT : EMC-Evaluation of CAN Transceivers V03/02, Zwickau
[ICTTS] GIFT/ICT : International Transceiver Conformance Test, Test Specification V1.2; 2002
; Communication & systems group, Wolfenbüttel

2.5.2 Physical Media Parameters

Physical media parameters of a pair of wires						
Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Impedance	Z	108	120	132	Ω	Measured between two signal wires
Length-related resistance	R	-	-	70	mΩ/m	1)
Specific line delay	t_{Delay}	-		5.5	ns/m	2)

Table 11. Physical Media Parameters

Notes to physical media parameters:

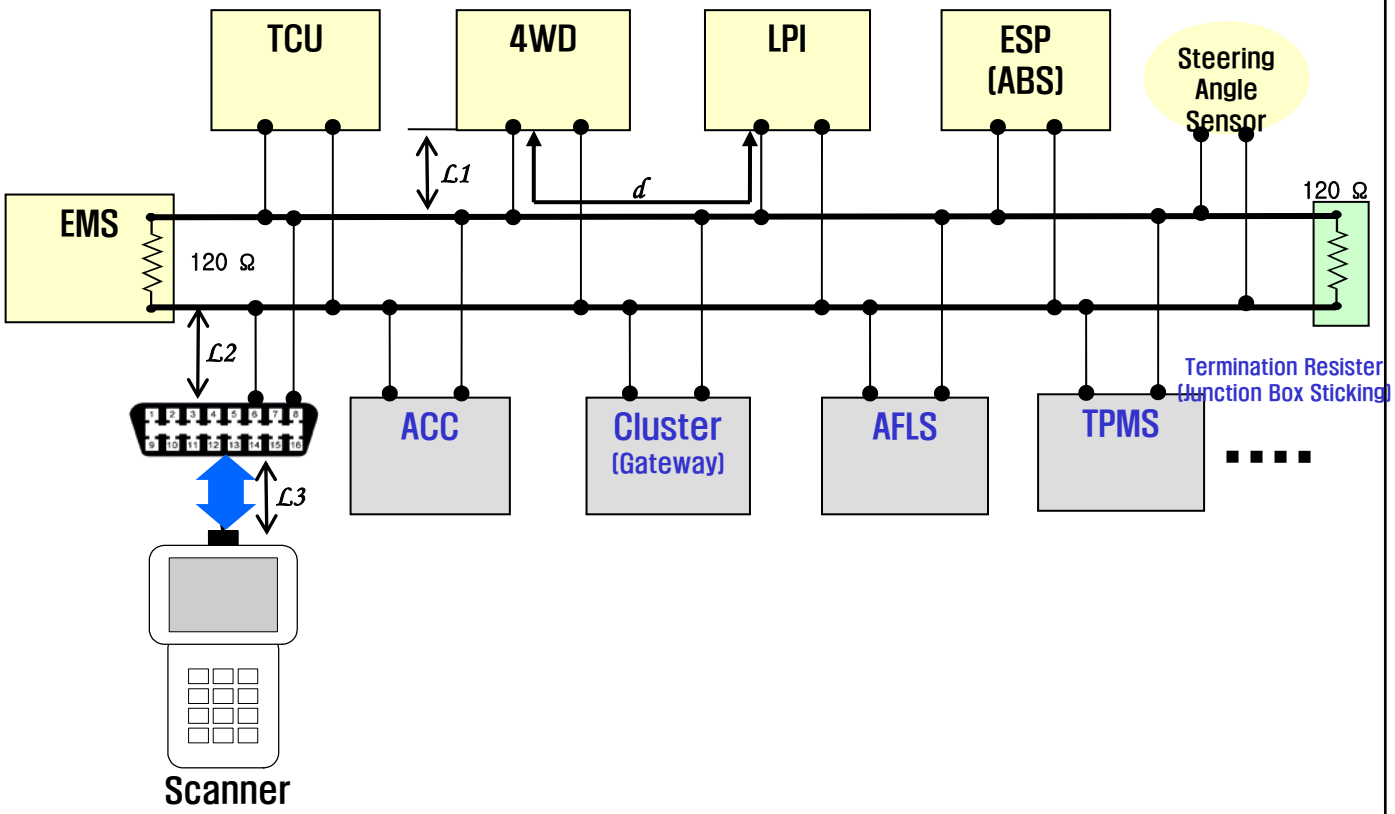
1) The differential voltage on the bus seen by a receiving CAN node depends on the line resistance between it and the transmitting CAN node. Therefore, the total resistance of the signal wires is limited by the bus level parameters of each CAN node.
2) The min. delay between two points of the bus may be zero. The max. value is determined by the bit time and the delay times of the transmitting and receiving circuitry.

2.5.3 Terminator Resistors Parameter

Termination resistor					
Symbol	Min	Typ	Max	Unit	Conditions
R_L	118	120	130	Ω	Min. Power dissipation : 220mW

Table 12. Termination Resistor

2.5.4 Bus Topology



Network topology parameters						
Parameter	Symbol	Min	Typ	Max	Unit	Conditions
ECU Cable Stub Length	ℒ1	0	-	1	m	1)
In-Vehicle DLC Cable Stub Length	ℒ2	0	-	1	m	
Off-Board DLC Cable Stub Length	ℒ3	0	-	5	m	
ECU Distance	d	0.1	-	30	m	Distance between any two ECUs on the bus, including cable stubs and an Off-Board Tool.

Table 13. Network Topology

@@
Notes to Network topology parameters:
1) In general longer stubs are not suitable. Nevertheless a single stub with L>1m might be acceptable under certain conditions after careful analysis and verification in a particular vehicle type on a case-by-case. Secondary bus termination is recommended to be placed at the end of long stubs.

2.5.5 Transmission and Bit timing parameters

The CAN data bus uses a data transfer rate of **500 kbit/sec**.

	Quartz					Unit
	8	10	12	16	16 < Fosc	MHz
Osc. Tolererance	< 0.5					%
1 bit time (bt)	2					μs
1 time quantum (Tq)	1/8 bt	1/10 bt	1/12 bt	1/16 bt	1/Fosc bt	-
Synchronization Jump Width	1 Tq			2 Tq	2 Tq	-
No. of Sample	Once					-
Sample point	Ratio = 3:1					-
Resynchronization	On the recessive to the dominant edge					-

Table 14. Bit Timing Parameters

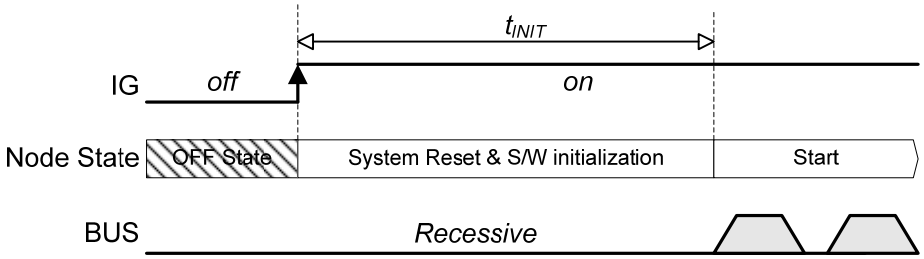
3. Network Specification

3.1 Initialization

After IG-On, the first message shall be sent within tansmission ready time(each specific time is defined in signal description chapter of this document) and all receive nodes shall complete reception ready before the first transmission message from transmission node. During initialization phase, each nodes shall set each receive signal values to initial value.

Parameter	Symbol	Min	Typ	Max	Unit	Condition
Initialization Time	t_{INIT}	120	-	500	ms	1)

Table 1. Initialization Parameter



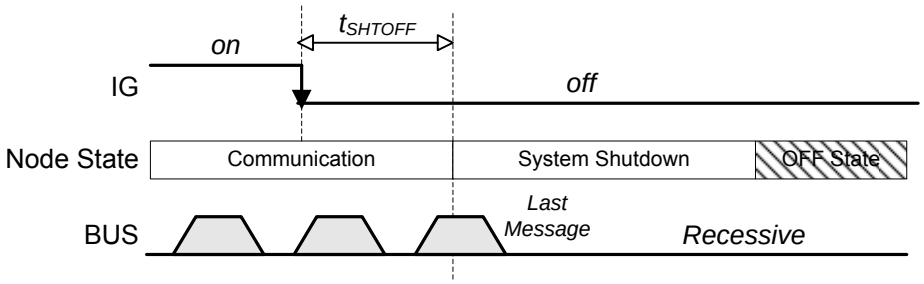
Note:
1) For function operation, each controller can increase initialization time Max value.

3.2 Shutoff Communication

After IG-Off, each node may shutoff its communication after wait time which is completion of last message and this time shall not exceed 500msec. If some nodes need communication after t_{SHTOFF}, the communication can be continued without communication errors and DTC.
※ Specially, the EMS should transfer the message during the power latch time.

Parameter	Symbol	Min	Typ	Max	Unit	Condition
Shutoff Time	t_{SHTOFF}	-	200	500	ms	

Table 2. Shutoff Parameter



3.3 Bus off

If a node detects bus off condition then the node shall reset its CAN controller within recovery time defined in below table. However, if the node detects again bus off condition after controller reset then it shall count up failure counter. And if the bus off condition is detected continuously and this counter reaches up to 10 without any successful message transmission of the corresponding ECU in between, then a diagnostics trouble code (DTC) has to be stored.
If the network returns to active state, the transmission of messages has to be enabled immediately.

Parameter	Symbol	Min	Typ	Max	Unit	Condition
Recovery Time	t_{RECVR}	50	-	100	ms	

Table 3. Communication Recovery Time

3.4 Timeout

The receivers of a signal are defined in the sheet for definition of a signal. Receivers have to monitor the availability of the corresponding messages in order to detect timeout conditions.
After the timeout detection is restarted by a message reception, the next message has to be received within the message timeout period.
If the next message with the same identifier is not received within the timeout period, it has to be assumed that a communication error has occurred. This affects all the signals of the corresponding message until the message is received again.
The timeout detection with a timeout period has to be enabled when the state network active is entered and disabled when the state network shutdown is entered.
%%
The timeout detection is always disabled during the following conditions:

- During the initialization time (see 3.1 Intialization - Table 1)
- During the shutoff time (see 3.2 Shutoff Communication - Table 2)
- After occurrence of a timeout until the next message with the expected identifier is received.
- Always for messages of the transmission type “on event”.
- During the Engine cranking time, ECUs using IG1 voltage shouldn't detect the timeout of ECUs using IG2 voltage. (see Message Validity of each Message Transmission Parameters)

If the timeout detection is enabled and a timeout occurs

1. it has to be handled either by using the appropriate default value defined by signal error identifier in this Specification or a specific procedure as described in ECU specification.
2. a DTC has to be recorded, if the battery voltage is in the range that is defined by Communication Reliability Voltage (see 2.4 CAN Hardware Interface Description - Table 8).

4. Message Overview

In this chapter all messages are listed. Each message could include up to 8 data bytes. For a detailed information of the data bytes, refer to chapter 5.

Message	Identifier	Transmit Unit	Receive Units
EMS1	0316H	EMS	ABS/TCS/ESC,TCU SCC, ACU, MDPS, %%SPAS,EPB
EMS2	0329H	EMS	ABS/TCS/ESC,TCU SCC,ACU,%%EPB
EMS3	0280H	EMS	LPI
EMS4	0545H	EMS	TCU,%%EPB
EMS5	02A0H	EMS	SCC, TCU, ESC,ACU
EMS6	0260H	EMS	ABS/TCS/ESC,TCU, SCC,%%EPB
EMS_H2	018FH	EMS	CLU, ESC,TCU, AEMC
TCS1	0153H	TCS/ESC	EMS,TCU, SCC,ACU, ##CLU, %%SPAS,EPB
TCS2	01F0H	TCS/ESC	EMS,TCU,ACU
TCS3	0430H	ESC	SCC, EMS
TCS4	04D0H	ESC/ABS	4WD
TCS5	01F1H	ESC	EMS, TCU, SCC, PGS CLU, 4WD, ACU,%%EPB
ABS1	0580H	ABS	EMS, TCU, 4WD,ACU PGS, ##CLU,%%SPAS, EPB
%% WHL_SPD	04B0H	ESC	SCC, AFLS, PGS
## WHL_PUL	04B1H	ABS/ESC	SPAS
TCU1	043FH	TCU	ABS/TCS/ESC,EMS SCC,AFLS,%%SPAS, EPB
TCU2	0440H	TCU	EMS
TCU3	0370H	TCU	EMS, ESC,CLU,CUbiS

DCT1	0330H	TCU	EMS,@@ESC
4WD1	0428H	4WD ECU	EMS, TCU, ACU ABS/TCS/ESC
4WD2	0429H	4WD ECU	EMS, TCU, ABS/TCS/ESC
LPI1	0271H	LPI	EMS
SAS1	02B0H	SAS	ESC, 4WD, ACU, %%SPAS
CAL_SAS	07C0H	ESC	SAS
SCC1	0420H	SCC	ESC, CLU, PSB
%% SCC2	05B5H	SCC	PSB, AAP
%% SCC3	0388H	SCC	ESC, PSB
%% EPB1	0433H	EPB	ESC, CLU
CLU1	04F0H	CLUSTER	SCC, ESC,ACU,%%EMS CUbiS,%%EPB,LDWS
CLU2	0690H	CLUSTER	ECS,ABS/ESC,PSB,EPB, LDWS,EMS,MTC, FATC/DATC,CUbiS, ACU,AFLS,%%SPAS
AFLS	0650H	AFLS	CLU
GPC1	0610H	ISS	EMS
EngFrzFrm1	00A0H	EMS	TCU
EngFrzFrm2	00A1H	EMS	TCU
TPMS1	05F0H	TPMS	CLU
REA1	0183H	REA	EMS
ECS1	05E0H	ECS	CLU
ECS2	03F9H	ECS	CLU
MDPS1	05E4H	MDPS	CLU, ESC,%%SPAS
$$ MDPS2	0392H	MDPS	SPAS
YRS1	0130H	YRS	ESC
YRS2	0140H	YRS	ESC
%% YRS3	0131H	YRS	ESC
ESP1	047FH	ESC	EPB, CLU, EMS

ESP2	0220H	ESC	SCC, ECS, AFLS, PSB, TCU,%%SPAS,LDWS, EPB,4WD
ESP3	0002H	ESC	YRS
%% ESP4	0385H	ESC	SCC
FATC	0350H	FATC	EMS,##CLU, SPAS
ACU1	05A0H	ACU	ODS
ACU2	05A1H	ACU	ODS
ACU3	0010H	ACU	ODS
ACU4	02C0H	ACU	CLU
ACU5	05A2H	ACU	CUbiS
ODS1	05FAH	ODS	ACU
ODS2	05FBH	ODS	ACU
ODS3	05FCH	ODS	ACU
%% LDWS1	03A0H	LDWS	CLU, PSB, Test Tools
RPAS1	0548H	RPAS	CLU
$$ SPAS1	0390H	SPAS	MDPS
%% SPAS2	0505H	SPAS	CLU
%% VSM1	0164H	ESC	MDPS
%% VSM2	0165H	MDPS	ESC
GST1	07DFH	TESTER (Scan Tool)	ALL
Development	ECU specific	0600H~067FH, Only 0610H, 0650H excluded	
	CCP Tool (0680H~06FFH, Only 0690H Excluded)	Reserved (0680H~069AH)	
		4WD (069BH~069FH)	
		EMS (06A0H~06A9H)	
		LPI (06AAH~06AFH)	
		TCU (06B0H~06B9H)	
		AFLS (06BAH~06BFH)	
		Chassis Control ECU (06C0H~06FFH)	
Diagnostics	EOL Tool (0700H~076FH)	Chassis Control ECU (0700H~074FH)	
		EMS (0750H~0759H)	

		ISS (075AH~075FH)
		TCU (0760H~076FH)
		RPAS (0770H)
	ECU specific	%% 0771H~~07AFH~~ 079FH
	OBD Diag. Tools MTS, CUbiS	%% ~~07B0H~~ 07A0~07BFH, 07C1H~07FFH (Refer to ES95485-00)

5. Signal Overview

This chapter describes all single information that is coded in the data bytes of the messages described in chapter 3.

Table 1

Label	Name	Message	Bits	Hex Range	Phys. Range	Update (ms)
aBasis	Acceleration for initialization	TCS3	11	00H ... 7FEH	-10.23 ... +10.23 m/s^2	20
ABS_ACT	ABS “control“ indication	TCS1	1	0/1	Logic	10
ABS_ACT	ABS “control“ indication	ABS1	1	0/1	Logic	20
ABS_DEF	ABS defective indication	TCS1	1	0/1	Logic	10
ABS_DEF	ABS defective indication	ABS1	1	0/1	Logic	20
ABS_DIAG	ABS “diagnostic mode” indication	ABS1	1	0/1	Logic	20
ABS_DIAG	ABS/TCS/ESC “diagnostic mode” indication	TCS1	1	0/1	Logic	10
ABS_W_LAMP	ABS Warning lamp	ABS1	1	0/1	Logic	20
ABS_W_LAMP	ABS Warning lamp	TCS5	1	0/1	Logic	20
ACC_ACT	Auto cruise control in activation	EMS2	1	0/1	Logic	10
ACCEL_REF_ACC	Vehicle acceleration	TCS3	11	00H ... 7FEH	-10.23 ... +10.23 m/s^2	20
ACCEnable	SCC acceleration/deceleration requests enabled	TCS3	2	0H ... 03H	logic	20
ACC_EQUIP	SCC Option Description	TCS3	1	0/1	Logic	20
ACCFailInfo	Indication of SCC-malfunction	SCC1	2	0H ... 03H	0…3	20
ACCMode	Status of SCC-SCU	SCC1	2	0H ... 03H	0…3	20
%% ACC_ObjDist	Distance to the SCC object	SCC2	11	0H..5DCH	0..150m	50
%% ACC_ObjLatPos	Lateral position of the SCC object	SCC2	9	0H..190H	-20..+20m	50
%% ACC_ObjRelSpd	Relative speed to the SCC object	SCC2	12	0H..9F6H	-170..+85m/s	50
%% ACC_ObjStatus	Status information of the SCC object	SCC2	2	0H ... 03H	Logic	50
ACC_REQ	Request SCC torque command	TCS3	1	0/1	Logic	20
ACCReqLim	SCC Request Limited	TCS3	2	0H ... 03H	Logic	20
ACK_ES	Acknowledge for engine stop	EMS2	1	0/1	Logic	10
ACK_TCS	Acknowledge for TCS	EMS1	1	0/1	Logic	10
ACT_Height	Actual level of vehicle	ECS1	4	0H..0FH	0...15	50

AFLS_STAT	AFLS function state	AFLS	2	0H .. 03H	0 … 3	100
AliveCounterACC	Message counter	SCC1	4	00H...0FH	Logic	20
AliveCounter	Alive signal	CLU1	8	0H...FFH	Logic	20
%%AliveCounter	Alive Counter	EMS5	2	0H..03H	0..3	10
AliveCounter	Alive Counter	EMS6	2	0H..03H	0..3	10
AliveCounterTCS	Alive rolling counter	TCS3	3	00 ... 07H	Logic	20
%%AliveCounter_TCS1	Alive-counter	TCS1	4	00H..0FH	Logic	10
AMP/MAP	Ambient pressure / Manifold Apsolute Pressure	EMS3	8/8	0..FFH/ 0..FEH	0..5412 hPa/ 0..119.527kPa	10/10
AMP_CAN	Atmospheric Pressure	EMS4	5	0...1FH	458.98...792.78 mmHg	10
aReqMax	Acceleration Request Upper Limit	SCC1	11	0H ... 7FEH	-10.23 ... +10.23 m/s^2	20
aReqMin	Acceleration Request Lower Limit	SCC1	11	0H ... 7FEH	-10.23 ... +10.23 m/s^2	20
AUTO_ACT	“AUTO“ mode indication	4WD1	1	0/1	Logic	20
AVH_ALARM	Audio output request	ESP1	2	00H..03H	Logic	20
AVH_CLU	Output data for cluster display	ESP1	8	00H..03H	Logic	20
AVH_I_LAMP	AVH active status lamp request to cluster	ESP1	2	00H..03H	Logic	20
AVH_LAMP	Info lamp request to cluster (red/green)	ESP1	4	00H..0FH	Logic	20
AVH_STAT	AVH State (Hydraulic Hold)	ESP1	2	0H..03H	Logic	20
BFS_CYL	Cylinder number of active cylinder at fuel switching	LPI1	8	0...06H	0..6	10
BRAKE_ACT	Indication of brake switch ON/OFF	EMS2	2	0...3H	Logic	10
BRAKE_ACT_TCU	Indication of brake switch on/off signal by TCU	TCU2	2	0H .. 03H	Logic	10
BrakeLight	Brake light activation during automatic braking	TCS3	1	0/1	Logic	20
%%Byte0Parity	Parity of Byte 0	EMS5	1	0/1	0..1	10
CAN_VERS	CAN version number	EMS2	6	0..3FH	Logic	10
CCW	Command code word	CAL_SAS	4	0...EH	0~15	Event
CF_Abg_DepEnt	Airbag Deploy Event	ACU1	1	0/1	Logic	1000
CF_Abg_DepInhEnt	Airbag Deploy Inhibited Event	ACU1	1	0/1	Logic	1000
CF_Acu_CshAct	Crash Active	ACU3	1	0/1	Logic	Event
CF_Acu_Dtc	DTC Byte	ACU5	16	-	Logic	1000
CF_Acu_FltStat	Fault Status	ACU5	2	0/3	Logic	1000
CF_Acu_NumOfFlt	Number Of Fault	ACU5	8	00H..FFH	Logic	1000
CF_ButSys_VarInd	Push Button start system variant Indicator	CLU1	1	0/1	Logic	20

CF_Clu_ActiveEcoSW	Indication of Active ECO switch	CLU2	1	0/1	Logic	100
##CF_Clu_AliveCnt2	Alive Counter	CLU2	4	0/15	Logic	100
CF_Clu_AltLStatus	Alternator L port Status	CLU2	1	0/1	Logic	100
%% ~~CF_Clu_DispInf~~	~~Device Information of Display~~	~~CLU1~~	~~1~~	~~0/1~~	~~Logic~~	~~20~~
CF_Clu_EcoDriveInf	Information of Economy Drive Indication	CLU2	3	0/7	Logic	100
##CF_Clu_HazardSW	Hazard Switch Status	CLU2	1	0/1	Logic	100
CF_Clu_HeadLampHigh	Head Lamp High Beam On/Off Information	CLU2	1	0/1	Logic	100
CF_Clu_HeadLampLow	Head Lamp Low Beam On/Off Information	CLU2	1	0/1	Logic	100
CF_Clu_LdwsSW	Operation LDWS Switch	CLU2	1	0/1	Logic	100
CF_Clu_RainSnsStat	Status of Rain Sensor	CLU2	3	0/6	Logic	100
%%CF_Clu_SldMainSW	Speed Limiter Main Switch On/Off Information	CLU1	1	0/1	Logic	20
CF_Clu_SwiGearR	MT Gear R Switch signal	CLU2	2	0/3	Logic	100
%%~~CF_Clu_TripInf~~	~~Trip computer Information~~	~~CLU1~~	~~1~~	~~0/1~~	~~Logic~~	~~20~~
CF_Clu_TurnSigLh	Status of Left Turn Signal On/Off	CLU2	1	0/1	Logic	100
CF_Clu_TurnSigRh	Status of Right Turn Signal On/Off	CLU2	1	0/1	Logic	100
CF_Clu_WiperAuto	Wiper Auto switch signal from MF SW	CLU2	1	0/1	Logic	100
CF_Clu_WiperHigh	Wiper High switch signal from MF SW	CLU2	1	0/1	Logic	100
CF_Clu_WiperIntSW	Wiper INT switch signal from MF SW	CLU2	1	0/1	Logic	100
CF_Clu_WiperIntT	Wiper INT T value from MF SW	CLU2	3	0H..04H	Logic	100
CF_Clu_WiperLow	Wiper Low switch signal from MF SW	CLU2	1	0/1	Logic	100
%%CF_DriBkeStat	Flag which indicate the driver braking state	ESP4	1	0/1	Logic	20
CF_DriBkl_FltStat	Driver Buckle Fault Status	ACU1	1	0/1	Logic	1000
CF_DriBkl_Stat	Driver Buckle Status	ACU1	1	0/1	Logic	1000
%%CF_Ems_AclAct	Accelerator pedal applied	EMS6	2	0H..03H	Logic	10
CF_Ems_DesCurGr	Desirable Gear of Current	EMS_H2	4	0..EH	Logic	10
CF_Ems_DownTarGr	Target Gear of Downshift	EMS_H2	1	0/1	Logic	10
@@CF_Ems_EtcLimpMod	ETC Limphome Mode flag	EMS_H2	1	0/1	Logic	10
%%CF_Ems_HPresStat	Fuel Tank High Pressure Status	EMS_H2	1	0/1	Logic	10
CF_Ems_IsgStat	Status of ISG	EMS_H2	3	0/7	Logic	10
CF_Ems_OilChg	Oil Level Lamp	EMS_H2	1	0/1	Logic	10
@@ CF_Ems_SldAct	Speed limiter device in activation	EMS_H2	1	0/1	Logic	10

@@CF_Ems_SldPosAct	Positive action at speed limiter function on request	EMS_H2	1	0/1	Logic	10
CF_Ems_UpTarGr	Target Gear of Upshift	EMS_H2	1	0/1	Logic	10
CF_EndBst_AgH	Error- VGT actuator angle too high	REA1	1	0/1	Logic	10
CF_EndBst_AgL	Error- VGT actuator angle too low	REA1	1	0/1	Logic	10
CF_EndBst_CanFlt	Error- VGT actuator CAN communication	REA1	1	0/1	Logic	10
CF_EndBst_EepFlt	Error- VGT actuator EEPROM	REA1	1	0/1	Logic	10
CF_EndBst_HbriOverCur	Error- VGT actuator H-bridge over-current	REA1	1	0/1	Logic	10
CF_EndBst_HbriOverTemp	Error- VGT actuator H-bridge over-temperature	REA1	1	0/1	Logic	10
CF_EndBst_ORVol	Error- VGT actuator supply voltage out of range	REA1	1	0/1	Logic	10
CF_EndBst_PosSnsKOR	Error- VGT actuator position sensor gain out of range	REA1	1	0/1	Logic	10
CF_EndBst_PosSnsOSOR	Error- VGT actuator position sensor offset in out of range	REA1	1	0/1	Logic	10
CF_EndBst_PwmDuH	Error- VGT actuator PWM input duty too high	REA1	1	0/1	Logic	10
CF_EndBst_PwmDuL	Error- VGT actuator PWM input duty too low	REA1	1	0/1	Logic	10
CF_EndBst_PwmFqOutRng	Error- VGT actuator PWM input frequency out of range	REA1	1	0/1	Logic	10
CF_EndBst_RamFlt	Error- VGT actuator RAM	REA1	1	0/1	Logic	10
CF_EndBst_RomFlt	Error- VGT actuator ROM	REA1	1	0/1	Logic	10
%% CF_Esc_Act	VSM active	VSM1	1	0/1	Logic	10
%% CF_Esc_AliveCnt	ESC alive counter	VSM1	4	0/15	Logic	10
%% CF_Esc_Chksum	Checksum	VSM1	8	0/255	Logic	10
%% CF_Esc_CtrMode	VSM Control mode	VSM1	3	0/7	Logic	10
%% CF_Esc_Def	Information regarding the VSM"defective"Indication	VSM1	1	0/1	Logic	10
%%CF_Esc_Limolnfo	Limo Information of Vehicle	TCS1	2	0/3	Logic	10
CF_Esp_DiagPtr	Diagnosis block pointer	ESP3	8	0/255	Logic	10
CF_Esp_FuncDem	System function demands	ESP3	8	0/255	Logic	10
CF_Fatc_AcnCltEnRq	A/C(COMP) Clutch enable request	FATC	1	0/1	Logic	10
CF_Fatc_AcnRqSwi	A/C request switch	FATC	1	0/1	Logic	10
CF_Fatc_BlwrMax	FATC Max Blower State	FATC	1	0/1	Logic	10
CF_Fatc_BlwrOn	Blower On Flag	FATC	1	0/1	Logic	10
## CF_Fatc_ChkSum	Check Sum	FATC	8	00H..FFH	Logic	10
##CF_Fatc_CtrInf	Heater Control information	FATC	3	0/7	Logic	10
CF_Fatc_EcvFlt	ECV Control Fault	FATC	1	0/1	Logic	10

##CF_Fatc_EngStartReq	Engine Auto Start request	FATC	1	0/1	Logic	10
CF_FATC_Iden	FATC ID	FATC	2	0/3	Logic	10
##CF_Fatc_IsgStopReq	ISG Stop enable/disable request	FATC	1	0/1	Logic	10
## CF_Fatc_MsgCnt	Alive Count	FATC	4	0/15	Logic	10
CF_HoodStat	Hood Latch Switch signal	CLU2	2	0H..03H	Logic	100
%%CF_Ldws_FunStop	LDWS Function is stopped by Wiper High Switch	LDWS1	1	0/1	Logic	20
%%CF_Ldws_HapWarning	Haptic Warning Device Operation Command	LDWS1	1	0/1	Logic	20
%%CF_Ldws_LHWarning	Left Lane Departure Warning Status	LDWS1	2	0H..03H	Logic	20
%%CF_Ldws_RecLL	Status of Recognition of Left Line	LDWS1	1	0/1	Logic	20
%%CF_Ldws_RecRL	Status of Recognition of Right Line	LDWS1	1	0/1	Logic	20
%%CF_Ldws_RHWarning	Right Lane Departure Warning Status	LDWS1	2	0H..03H	Logic	20
%%CF_Ldws_SpdExceed	Vehicle Speed Exceed given Threshold Speed	LDWS1	1	0/1	Logic	20
%%CF_Ldws_SysStat	LDWS System Status	LDWS1	3	0H..07H	Logic	20
%%CF_Ldws_TurnSigLh	Status of Left Turn Signal On/Off	LDWS1	1	0/1	Logic	20
%%CF_Ldws_TurnSigRh	Status of Right Turn Signal On/Off	LDWS1	1	0/1	Logic	20
$$CF_Mdps_AliveCnt	Free-running alive counter	MDPS2	8	00H..FFH	Logic	20
%% CF_Mdps_AliveCnt	MDPS alive counter	VSM2	4	00H..0FH	Logic	10
$$CF_Mdps_Chksum	Signal checksum	MDPS2	8	00H..FFH	Logic	20
%% CF_Mdps_Chksum	Checksum	VSM2	8	00H..FFH	Logic	10
%% CF_Mdps_Def	Information indicating MDPS status	VSM2	1	0/1	Logic	10
%% CF_Mdps_SErr	Information indicating VSM1 signal status	VSM2	1	0/1	Logic	10
$$ CF_Mdps_Stat	MDPS Status	MDPS2	4	00H..0FH	Logic	20
CF_Mdps_WLmp	MDPS Warning Lamp	MDPS1	1	0/3	Logic	100
CF_Ods_AcuRcvSN	ACU_SN_Received	ODS1	1	0/1	Logic	1000
CF_Ods_BtsFail	Belt Tension Sensor Failure	ODS1	1	0/1	Logic	1000
CF_Ods_EcuFail	PODS-B ECU Failure	ODS1	1	0/1	Logic	1000
CF_Ods_EolCal	Seat EOL Calibration Flag	ODS1	1	0/1	Logic	1000
CF_Ods_FltClrReq	ODS Fault Clear Request	ACU1	1	0/1	Logic	1000
CF_Ods_IDRcv	ODS ID Received	ACU1	1	0/1	Logic	1000
CF_Ods_OccStat	Occupancy Status	ODS1	1	0/1	Logic	1000
CF_Ods_PrcCmd	Command in process	ODS1	1	0/1	Logic	1000

CF_Ods_PsFail	Pressure Sensor Failure	ODS1	1	0/1	Logic	1000
CF_Ods_RZReq	ODS Empty Seat Rezero Request	ACU1	1	0/1	Logic	1000
CF_Ods_SNRcv	ODS SN Received	ACU1	1	0/1	Logic	1000
CF_Ods_WgtStat	Weight status	ODS1	1	0/1	Logic	1000
CF_PasBkl_FltStat	Passenger Buckle Fault Status	ACU1	1	0/1	Logic	1000
CF_PasBkl_Stat	Passenger Buckle Status	ACU1	1	0/1	Logic	1000
CF_Rpas_IndCL	Center Left Warning indicator Command	RPAS1	3	0/4	Logic	100
CF_Rpas_IndCR	Center Right Warning indicator Command	RPAS1	3	0/4	Logic	100
CF_Rpas_IndL	Left Warning indicator Command	RPAS1	3	0/4	Logic	100
CF_Rpas_IndR	Right Warning indicator Command	RPAS1	3	0/4	Logic	100
CF_SBR_Ind	Seat Belt Reminder Indication	ACU4	2	0H..03H	Logic	10
$$CF_Spas_AliveCnt	Message counter	SPAS1	8	0..FFH	Logic	20
$$CF_Spas_Chksum	Signal checksum	SPAS1	8	0..FFH	Logic	20
%% CF_Spas_Disp	SPAS/PAS display ON/OFF status	SPAS2	2	0H..03H	Logic	50
%%CF_Spas_FI_Ind	Front inner sensor warning indicator	SPAS2	3	0H..07H	Logic	50
%%CF_Spas_FIL_Ind	Front inner left sensor warning indicator	SPAS2	3	0H..07H	Logic	50
%%CF_Spas_FIR_Ind	Front inner right sensor warning indicator	SPAS2	3	0H..07H	Logic	50
%%CF_Spas_FOL_Ind	Front outer left sensor warning indicator	SPAS2	3	0H..07H	Logic	50
%%CF_Spas_FOR_Ind	Front outer right sensor warning indicator	SPAS2	3	0H..07H	Logic	50
%%CF_Spas_HMI_Stat	HMI status for SPAS display	SPAS2	8	0H..FFH	Logic	50
%%CF_Spas_RI_Ind	Rear inner sensor warning indicator	SPAS2	3	0H..07H	Logic	50
%%CF_Spas_RIL_Ind	Rear inner left sensor warning indicator	SPAS2	3	0H..07H	Logic	50
%%CF_Spas_RIR_Ind	Rear inner right sensor warning indicator	SPAS2	3	0H..07H	Logic	50
%%CF_Spas_ROL_Ind	Rear outer left sensor warning indicator	SPAS2	3	0H..07H	Logic	50
%%CF_Spas_ROR_Ind	Rear outer right sensor warning indicator	SPAS2	3	0H..07H	Logic	50
$$ CF_Spas_Stat	SPAS Status	SPAS1	4	0..0FH	Logic	20
%% StopReq	Stop request flag	SCC1	1	0/1	Logic	20
CF_StrRly_Stat	Starter Relay High side driver status from PDM	CLU1	1	0/1	Logic	20
CF_SWL_Ind	System Warning Lamp Indication	ACU4	2	0H..03H	Logic	10
CF_SWL_Ind	System Warning Lamp Indication	ACU5	2	0H..03H	Logic	1000
CF_SWL_Stat	SRS Warning lamp status	CLU2	3	0...07H	Logic	100

CF_Tcu_Alive	Alive Counter	TCU2	2	0H..03H	Logic	10
@@ CF_Tcu_Alive2	Alive Counter	DCT1	4	0..FH	Logic	10
CF_Tcu_BkeOnReq	Brake ON Request	TCU3	2	0H..03H	Logic	10
CF_Tcu_ChgInhAC	Inhibit AC status change	DCT1	1	0..01H	Logic	10
CF_Tcu_ChkSum	Checksum	TCU2	2	0H..03H	Logic	10
@@ CF_Tcu_ChkSum2	Checksum	DCT1	4	0..FH	Logic	10
CF_Tcu_CltStat	DCT clutch status	DCT1	1	0..01H	Logic	10
@@ CF_Tcu_InhCda	Inhibition of CDA Transition	TCU3	1	0..01H	Logic	10
CF_Tcu_NCStat	The status of NC	TCU3	2	0H..03H	Logic	10
CF_Tcu_ShfPatt	ID of current shift pattern	TCU3	4	0..FH	Logic	10
CF_Tcu_TarGr	Target of gear change	TCU3	4	0..FH	Logic	10
@@CF_Tcu_TqIncReq	Request for Torque Increase	DCT1	1	0..01H	Logic	10
CF_Tcu_TqGrdLim	Torque gradient limitation	TCU3	8	0..FFH	0...2540 Nm/s	10
CF_TTL_Ind	Telltale Lamp Indication	ACU4	2	0..3H	Logic	10
%%CF_VSM_Avail	Flag which tells if ESC is available for VSM or not	ESP4	1	0..3H	Logic	20
%%CF_VSM_BeltCmd	Command to active the seat belt	SCC3	3	0..7H	Logic	20
%%CF_VSM_Coded	Flag which tells if ESC is coded for VSM or not	ESP4	1	0/1	Logic	20
%%CF_VSM_ConfMode	Signal whitch shows the configuration mode of	SCC3	3	0H..07H	Logic	20
%% CF_VSM_ConfSwi	Switch state which is to change VSM2 configuration	ESP4	2	0H..03H	Logic	20
%%CF_VSM_DecCmdAct	Flag which indicates that the deceleration command from	SCC3	1	0/1	Logic	20
%%CF_VSM_Handshake	Flag which tells if ESC is ok or not	ESP4	1	0/1	Logic	20
%%CF_VSM_HBACmd	Command to use lowered HBA (Hydraulic Boost Assist)	SCC3	2	0..3H	Logic	20
%%CF_VSM_Prefill	Command to activate pre-fill	SCC3	1	0/1	Logic	20
%%CF_VSM_Stat	Flag which tells status of APIA functionality	SCC3	2	0..3H	Logic	20
%%CF_VSM_Warn	VSM warning level	SCC3	2	0..3H	Logic	20
%% CF_Yrs_AxStat	Status information for AX signal	YRS3	4	0...FH	Logic	10/20
%%CF_Yrs_YawAccStat	Yaw rate acceleration status	YRS3	4	0...FH	Logic	10/20
CF_Yrs_ExtSysStat	Extended system status	YRS2	8	0..FFH	Logic	10
CF_Yrs_LatAcStat1	Status information for Lateral acceleration signal	YRS1	4	0...FH	Logic	10
CF_Yrs_Type	Supported signal information	YRS2	4	0...FH	Logic	10
CF_Yrs_McuStat	MCU status	YRS2	8	0..FFH	Logic	10

CF_Yrs_SnsStat1	Sensor status	YRS1	4	0...FH	Logic	10
CF_Yrs_SnsStat2	Sensor status	YRS2	8	0...FFH	Logic	10
CF_Yrs_YrStat	Status information for Yaw rate signal	YRS1	4	0...FH	Logic	10
CheckSum	Value to check the message bytes	SAS1	4	0...FH	0~15	10
Checksum	Checksum	EMS6	4	0...FH	0~15	10
%%CheckSum_TCS1	CheckSum	TCS1	8	-	Logic	10
CheckSum_TCS3	Signal checksum	TCS3	4	0...FH	0~15	20
CLU_ACK	Clutch operation acknowledge	EMS2	1	0/1	Logic	10
CLU_DUTY	4WD clutch duty cycle	4WD1	8	0...64H FFH	0 ~ 100% Error	20
CONF_MIL_FMY	Configuration of MIL Hand- ling and Failure Memory Management by ECU	EMS2	3	0..4H	0..4	10
CONF_TCU	A/T or M/T information	EMS2	6	0..FH	Logic	10
CR_Acu_DepEntCnt	ACU Deploy Event Counter	ACU1	8	0H..0EH	0...14	1000
CR_Acu_DepMsgCnt	ACU Deploy Message Counter	ACU1	8	0H..32H	0...50	1000
CR_Acu_SN	ACU Serial Number	ACU2	64	-	-	1000
CR_EndBst_ActPos	VGT actuator actual position	REA1	1	0011H.. 03F1H	1.989..118.053°	10
CR_EndBst_DemPos	VGT actuator demand position	REA1	1	0..03FFH	0..119.691°	10
CR_EndBst_HbriPwr	VGT actuator H-bridge output power	REA1	1	0..08AEH	0..99.99%	10
%% CR_Esc_StrTqReq	Steering torque request	VSM1	12	000H ... FFEH	-20.48 ~ 20.46 Nm	10
%%CR_ESP_Alive	ESP4 Message Alive-counter	ESP4	4	0H..0EH	0...14	20
%%CR_ESP_ChkSum	ESP4 Message Checksum	ESP4	4	-	-	20
CR_Esp_Crc	Cyclic redundancy check	ESP3	8	0..FFH	0..255	10
CR_Esp_MsgCnt	Message counter	ESP3	4	0..FH	0..15	10
## CR_Fatc_OutTemp	Outside Temperature(FATC)	FATC	8	00H..C8H	-40 .. 60 ℃	10
##CR_Fatc_OutTempSns	Temperature of Ambient Sensor	FATC	8	00H..C8H	-40 .. 60 ℃	10
CR_Fatc_TqAcnOut	Calculated A/C COMP torque	FATC	8	0..FEH	0..50.8 Nm	10
$$ CR_Mdps_DrvTq	Driver Torque Feedback	MDPS2	12	000H .. FFEH	-20.48 ~ 20.46 Nm	20
%%CR_Mdps_OutTq	MDPS column torque	VSM2	12	000H ... FFEH	-204.8 ~ 204.6 Nm	10
$$ CR_Mdps_StrAng	MDPS Steering Angle	MDPS2	16	0000H.. FFFFH	-3276.8 ~ 3276.7 Deg	20
%% CR_Mdps_StrTq	Steering torque sensor value	VSM2	12	000H ... FFEH	-20.48 ~ 20.46 Nm	10

CR_Ods_Chksum_H	Cal Checksum High Byte	ODS3	8	0..FFH	0...255	1000
CR_Ods_Chksum_L	Cal Checksum Low Byte	ODS3	8	0..FFH	0...255	1000
CR_Ods_ID	ODS_ ID	ODS3	8	0..FFH	0...255	1000
CR_Ods_RomID_H	ROM ID High Byte	ODS3	8	0..FFH	0...255	1000
CR_Ods_RomID_L	ROM ID Low Byte	ODS3	8	0..FFH	0...255	1000
CR_Ods_SerNum0	ODS_SerialNumber Byte 0	ODS2	8	-	0...255	1000
CR_Ods_SerNum1	ODS_SerialNumber Byte 1	ODS2	8	-	0...255	1000
CR_Ods_SerNum2	ODS_SerialNumber Byte 2	ODS2	8	-	0...255	1000
CR_Ods_SerNum3	ODS_SerialNumber Byte 3	ODS2	8	-	0...255	1000
CR_Ods_SerNum4	ODS_SerialNumber Byte 4	ODS2	8	-	0...255	1000
CR_Ods_SerNum5	ODS_SerialNumber Byte 5	ODS2	8	-	0...255	1000
CR_Ods_SerNum6	ODS_SerialNumber Byte 6	ODS2	8	-	0...255	1000
CR_Ods_SerNum7	ODS_SerialNumber Byte 7	ODS2	8	-	0...255	1000
$$CR_Spas_StrAngCmd	Steering angle command	SPAS1	16	0000H .. FFFFH	-32768..32767	20
CR_Tcu_CreepTq	Pre-control torque for creeping	DCT1	10	000H .. 3FFH	-512 .. 511 Nm	10
##CR_Tcu_ShiftTq	Pre-control torque for shifting	DCT1	8	00H .. FFH	0 .. 99.6094%	10
@@ CR_Tcu_TqDec	DCT TCU requested engine torque decrease	DCT1	8	00H .. FFH	0..99.6094%	10
@@ CR_Tcu_TqInc	DCT TCU requested engine torque increase	DCT1	8	00H .. FFH	0..99.6094%	10
CRUISE_LAMP_M	Cruise MAIN switch indication lamp on request	EMS6	1	0/1	Logic	10
CRUISE_LAMP_S	Cruise SET switch indication lamp on request	EMS6	1	0/1	Logic	10
%%CR_VSM_Alive	SCC3 Message Alive-counter	SCC3	4	0..0EH	0~15	20
%%CR_VSM_ChkSum	SCC3 Message Checksum	SCC3	4	-	-	20
%%CR_VSM_DecCmd	Deceleration command	SCC3	8	0..96H	0~1.5	20
CR_Wcs_ClassStat	Occupant Classification Status	ODS1	8	00..04H	0..4	1000
CR_Wcs_ErrStat	Self Diagnostic Status byte	ODS1	8	00..3FH	0..63	1000
%% CR_Yrs_Ax	Longitudinal acceleration	YRS3	16	0…FFFEH	-4.1768 … 4.1765g	10/20
CR_Yrs_Crc1	Cyclic redundancy check	YRS1	8	0..FFH	0..255	10
CR_Yrs_Crc2	Cyclic redundancy check	YRS2	8	0..FFH	0..255	10
%% CR_Yrs_Crc3	CRC acc. SAE J1850 standard	YRS3	8	0..FFH	0..255	10/20
CR_Yrs_Diag	Diagnosis, serial ASCII code	YRS2	8	0..FFH	0..255	10
CR_Yrs_LatAc	Lateral acceleration	YRS1	16	0..FFFEH	-4,1768 .. 4.1765g	10

CR_Yrs_MsgCnt1	Message counter	YRS1	4	0..FH	0..15	10
CR_Yrs_MsgCnt2	Message counter	YRS2	4	0..FH	0..15	10
%%CR_Yrs_MsgCnt3	Message counter	YRS3	4	0..FH	0..15	10/20
%% CR_Yrs_YawAcc	Yaw rate acceleration	YRS3	16	0..FFFEH	-4096 … 4095.75°/s2	10/20
CR_Yrs_Yr	Yaw rate	YRS1	16	0..FFFEH	-163.84 ..163.83 °/s	10
CTR_IG_CYC_OBD	Ignition cycle counter	EMS5	16	0..FFFFH	0~65535	10
CTR_CDN_OBD	General denominator calculation	EMS5	16	0..FFFFH	0~65535	10
CUR_GR	Current Gear	TCU2	4	0H..FH	Logic	10
CYL_PRES	Master cylinder pressure	ESP2	12	0..FFEH FFFH	0…409.4 bar	10
CYL_PRES_STAT	Master cylinder pressure state	ESP2	1	0/1	Logic	10
CYL_PRESS_DIAG	Diagnosis mode of master cylinder pressure	ESP2	1	0/1	Logic	10
Damping_Mode	Actual damping mode	ECS1	2	0H..03H	Logic	50
DashACCFail	Failure in SCC message detected by dashboard	CLU1	1	0/1	Logic	20
DBC_CTL	DBC “control” indication	TCS1	1	0/1	Logic	10
DBC_DEF	DBC “defective” indication	TCS1	1	0/1	Logic	10
DBC_F_LAMP	DBC Function lamp	TCS5	2	0/3	Logic	20
DBC_PAS	DBC stand by	TCS1	1	0/1	Logic	10
DBC_W_LAMP	DBC Warning lamp	TCS5	1	0/1	Logic	20
DCEnable	Enable deceleration control	TCS3	1	0/1	Logic	20
DISFail	Failure in dashboard	CLU1	1	0/1	Logic	20
%% DriverAlert	Alert signal to inform of SCC function cancel	SCC1	1	0/1	Logic	20
DriverAlertDisplay	Driver display information	SCC1	2	00H ... 03H	Logic	20
DriverBraking	Indication of brake pedal activation	TCS3	1	0/1	Logic	20
DriverOverride	Driver is requesting more acceleration/deceleration than SCC	TCS3	2	00H ... 03H	Logic	20
DRV_DR_SW	Driver door switch	CLU2	2	0..3H	Logic	100
DRV_Seat_Belt	Driver Seat Belt Indicator	CLU2	2	00H..03H	Logic	100
DRV_Key_Lock	Driver door key lock	CLU2	1	0/1	Logic	100
DRV_Key_Unlock	Driver door key unlock	CLU2	1	0/1	Logic	100
EBD_DEF	EBD defective indication	TCS1	1	0/1	Logic	10
EBD_DEF	EBD defective indication	ABS1	1	0/1	Logic	20

EBD_W_LAMP	EBD Warning lamp	ABS1	1	0/1	Logic	20
EBD_W_LAMP	EBD Warning lamp	TCS5	1	0/1	Logic	20
ECGPOvrd	Driver override	EMS5	1	0/1	Logic	10
ECS_DEF	Indicates ECS error state	ECS1	1	0/1	Logic	50
ECS_DIAG	Indicates ECS is in diagnosis state	ECS1	1	0/1	Logic	50
ECS_W_lamp	Warning lamp	ECS1	1	0/1	Logic	50
ENG_CHR	Engine Characteristic – Kind of fuel, ETS	EMS2	4	0...3H	Logic	10
ENG_STAT	Engine Status	EMS6	3	0...07H	Logic	10
ENG_VOL	Engine Displacement	EMS2	8	0...FFH	0~25.5 liter	10
EOS	Engine operating status	EMS3	8	0...FFH	Logic	10
%%EPB_ALARM	Audio output request	EPB1	2	00H..03H	Logic	20
%%EPB_CLU	Output data for cluster	EPB1	8	TBD	TBD	20
%%EPB_DBF_DECEL	Requested deceleration for DBF	EPB1	8	00H..FEH	0..2.54 g	20
%%EPB_DBF_REQ	EPB Dynamic Braking request	EPB1	1	0/1	Logic	20
%%EPB_FAIL	Information about the availability of EPB	EPB1	3	0/7	Logic	20
%%EPB_F_LAMP	Failure lamp request for cluster (yellow)	EPB1	2	00H..03H	Logic	20
%%EPB_FORCE	Actual force of EPB	EPB1	12	000H.. FA0H	-1000..3000 N	20
%%EPB_FRC_ERR	Force status error description	EPB1	2	00H..03H	Logic	20
%%EPB_I_LAMP	Info lamp request for cluster	EPB1	4	0H..0FH	Logic	20
%%EPB_RBL	Rear brake light activation	EPB1	1	0/1	Logic	20
%%EPB_STATUS	Force status of EPB	EPB1	3	00H..07H	Logic	20
%%EPB_SWITCH	Status of EPB control switch	EPB1	2	00H..03H	Logic	20
ERR_FUEL	Error in the gasoline ECU	EMS3	8	0...FFH	Logic	10
ERR_GAS	Error in LPI interface box	LPI1	8	0...FFH	Logic	10
%%ESP_ACK	Acknowledge for ESC request	EPB1	1	0/1	Logic	20
ESP_CTL	ESC “control“ indication	TCS1	1	0/1	Logic	10
ESP_DEF	ESC defective indication	TCS1	1	0/1	Logic	10
ESP_PAS	ESC disabled by user	TCS1	1	0/1	Logic	10
## ESS_STAT	ESS system status	TCS1	2	0..3H	Logic	10
## ESS_STAT	ESS system status	ABS1	2	0..3H	Logic	20
ETL_TCU	TCU requests engine torque limit (ETL)	TCU2	8	0...FFH	0~508Nm or 0~762Nm	10

FAN_CTRL_TCU	Cooling fan control request by TCU	TCU2	2	0H..03H	0..3	10
F_N_ENG	fault engine speed signal	EMS1	1	0/1	Logic	10
F_OBD	OBD related fault	TCU1	1	0/1	Logic	10
F_SUB_TQI	error on MAF signal	EMS1	1	0/1	Logic	10
F_TCU	TCU fault status	TCU1	2	0..3H	Logic	10
FAC_TI_GAS_COR	Injection time correction factor for LPG	LPI1	16	0...FFFFH	0..1.999	10
FA_PV_CAN	Filtered Accelerator Pedal Value	EMS5	8	00..FEH	0..99.2%	10
FCO	Fuel consumption	EMS4	16	0..FFFFH	0..8388.6 µl	10
FLSS	Front left speed sensor	4WD2	8	0..FEH FFH	0..254 km/h Fault	20
FRM_FORMAT	Functionally requested diagnostic message frame	GST1	8	0..1FH	Logic	-
FRSS	Front right speed sensor	4WD2	8	0..FEH FFH	0..254 km/h Fault	20
FTL_AFU	Fuel tank level alternative fuel	LPI1	8	0...FFH	0..99.6%	10
FUEL_CUT_TCU	Fuel cut request during garage shift	TCU2	1	0/1	Logic	10
FUP_LPG_MMV	LPG Gas Fuel Pressure	LPI1	8	00..FFH	0..32640hPa	10
GEAR_TYPE	Number of gear steps of A/T	TCU1	4	0H .. 0FH	Speed A/T	10
GLOW_STAT	Glow lamp status	EMS6	1	0/1	Logic	10
%%GoNotify	Go notify alert	SCC1	1	0/1	Logic	20
GPCM_CTRL	Current state of the glow plug controller	GPC1	4	0H .. 0FH	Logic	100
GPCM_ERROR	Main GPCM error status	GPC1	4	0H .. 0FH	Logic	100
GPC_OT_STAT	Glow control unit – Over temperature status	GPC1	2	0H .. 03H	Logic	100
GPC_OV_STAT	Glow control unit – Over voltage status	GPC1	2	0H .. 03H	Logic	100
GPC_SW_COND	Switch defect and conduct condition	GPC1	2	0H .. 03H	Logic	100
GPC_SW_OPEN	Switch defect and open condition	GPC1	2	0H .. 03H	Logic	100
GP_CTL	Glow plug control request	EMS2	2	00..03H	Logic	10
GPC_TO_STAT	Glow control unit – CAN message timeout	GPC1	2	0H .. 03H	Logic	100
GPC_UV_STAT	Glow control unit – Under voltage status	GPC1	2	0H .. 03H	Logic	100
GPLG1_STAT	Status of Glow Plug #1	GPC1	4	0H .. 0FH	Logic	100
GPLG2_STAT	Status of Glow Plug #2	GPC1	4	0H .. 0FH	Logic	100
GPLG3_STAT	Status of Glow Plug #3	GPC1	4	0H .. 0FH	Logic	100
GPLG4_STAT	Status of Glow Plug #4	GPC1	4	0H .. 0FH	Logic	100
GPLG5_STAT	Status of Glow Plug #5	GPC1	4	0H .. 0FH	Logic	100

GPLG6_STAT	Status of Glow Plug #6	GPC1	4	0H .. 0FH	Logic	100
G_SEL_DISP	gear shift selector display	TCU1	4	0..FH	Logic	10
HAC_CTL	HAC “control” indication	TCS1	1	0/1	Logic	10
HAC_DEF	HAC “defective” indication	TCS1	1	0/1	Logic	10
HAC_PAS	HAC stand by	TCS1	1	0/1	Logic	10
Height_FL	Height of front left corner	ECS2	8	00H ... FDH	-128... 125mm	20
Height_FR	Height of front right corner	ECS2	8	00H ... FDH	-128... 125mm	20
Height_RL	Height of rear left corner	ECS2	8	00H ... FDH	-128... 125mm	20
Height_RR	Height of rear right corner	ECS2	8	00H ... FDH	-128... 125mm	20
IDLE_UP_TCU	TCU requests engine idle RPM up	TCU2	1	0/1	Logic	10
IGN_SW	Ignition key switch status	CLU2	3	00H..07H	0~7	100
IM_AUTEHN	Authentication immobilizer	EMS4	1	0/1	Logic	10
IM_STAT	Status immobilizer	EMS4	1	0/1	Logic	10
INH_DC_OBD	Inhibiti of rate-based monitoring	EMS5	1	0/1	Logic	10
INH_FUEL_CUT	Inhibition of engine fuel cut off	TCU2	1	0/1	Logic	10
IntAirTemp	Intake air temperature	EMS5	8	0..FEH FFH	-48..+142,5°C Fault	10
2H_ACT	“2H“ mode indication	4WD1	1	0/1	Logic	20
4H_ACT	“4H“ mode indication	4WD1	1	0/1	Logic	20
4WD_CLU_LIM	4WD clutch duty limit	TCS4	8	01H ... FEH	0.390625 ... 99.2188 %	20
4WD_ERR	4WD ECU faults code	4WD1	8	0...FFH	Logic	20
4WD_LIM_MODE	4WD transmission torque limitation mode selection	TCS4	1	0/1	Logic	20
4WD_LIM_REQ	Request duty limit of rear wheel of 4WD	TCS4	1	0/1	Logic	20
4WD_OPEN	4WD fast opening of cardan shaft clutch	TCS4	2	0..03H	Logic	20
4WD_SUPPORT	Information of supporting signals	4WD1	2	0..03H	Logic	20
4WD_SW	Software version	4WD1	8	0..FFH	0.0 ~ 15.15	20
4WD_TQC_LIM	4WD cardan shaft torque limit	TCS4	16	0..FAFFH	0..64255	20
4WD_TQC_CUR	4WD current cardan shaft torque	4WD1	16	0..FAFFH	0..64255	20
4WD_TYPE	Information of 4WD type	4WD1	2	0..03H	Logic	20
LAT_ACCEL	Lateral acceleration speed	ESP2	11	0..7FEH 7FFH	-10.23... 10.23 m/s^2	10
LAT_ACCEL_STAT	Lateral acceleration signal state	ESP2	1	0/1	Logic	10

LAT_ACCEL_DIAG	Diagnosis mode of lateral acceleration	ESP2	1	0/1	Logic	10
L_CHG_NA	Height level change is not available	ECS1	1	0/1	Logic	50
LDM_STAT	Readiness of ESC to perform DBF	ESP1	1	0/1	Logic	20
Lifting	Lift up to higher level	ECS1	1	0/1	Logic	50
L_MIL	Check engine lamp	EMS4	1	0/1	Logic	10
LOCK_ACT	“LOCK“ mode indication	4WD1	1	0/1	Logic	20
LONG_ACCEL	Longitudinal acceleration speed	ESP2	11	0..7FEH 7FFH	-10.23... 10.23 m/s^2	10
L ONG _ A C C EL_STAT	Longitudinal acceleration signal state	ESP2	1	0/1	Logic	10
L ONG _ A C C EL_DIAG	Diagnosis mode of Longitudinal acceleration	ESP2	1	0/1	Logic	10
LOW_ACT	“LOW“ mode indication	4WD1	1	0/1	Logic	20
Lowering	Lower down to lower level	ECS1	1	0/1	Logic	50
LPI_OBD	OBDII status of Lpi IB	LPI1	4	0..FH	Logic	10
LV_BFS_CFIRM	Bi-Fuel switch confirmation	EMS3	1	0/1	Logic	10
LV_BFS_IN_PRO GRESS	Bi-Fuel switch in progress	LPI1	1	0/1	Logic	10
LV_CONF_INJEC TION_DELAY	Configuration for injection delay	LPI1	1	0/1	Logic	10
LV_CRASH	Bit for Crash detection	EMS3	1	0/1	Logic	10
LV_ENG_TURN	Information Bit for First Engine Turning detected	EMS3	1	0/1	Logic	10
LV_FUEL_TYPE_B OX	Indicator of activated fuel type	LPI1	1	0/1	Logic	10
LV_FUEL_TYPE_E CU	Indicator of the fuel type in the gasoline ECU	EMS3	1	0/1	Logic	10
LV_FUP_ENA_TH D	Fuel pressure state	LPI1	1	0/1	Logic	10
LV_GAS_OK	Gas system state	LPI1	1	0/1	Logic	10
LV_GSL_MAP	Indication of AMP or MAP	EMS3	1	0/1	Logic	10
LV_LPG_SW_DRI VER_REQ	LPG Switch on/off state	LPI1	1	0/1	Logic	10
LV_PRE_CDN_LE AK	Condition for injector leak monitoring	LPI1	1	0/1	Logic	10
LV_VB_OFF_ACT	Battery off detection	EMS3	1	0/1	Logic	10
MAF	Mass air flow	EMS3	8	0..FFH	0..1389 mg/TDC	10
MAF_FAC_ALTI_ MMV	Mass air flow correction factor for altitude	EMS2	8	0...FFH	0...1,992	10
%% MainMode_ACC	Main switch status of SCC	SCC1	1	0/1	Logic	20
MaxGear	Requested gear upper limit	TCS3	3	0...7H	0~7	20
MinGear	Requested gear lower limit	TCS3	3	0...7H	0~7	20
MsgCount	Number of message	SAS1	4	0...EH	0~15	10

MSR_C_REQ	Request for MSR Function	TCS1	1	0/1	Logic	10
MUL_CODE	Code for multiplexed information	EMS2	2	0..3H	Logic	10
MUL_INFO	Multiplexed information	EMS2	6	0..3FH	Logic	10
N	Engine speed	EMS1	16	0..FFFFH	0..16383,75 rpm	10
N_32	Engine speed in 32bit resolution	EMS3	16	0...FFH	0...8160 rpm	10
N_INC_TCU	Engine speed increasing requirement flag	TCU2	1	0/1	Logic	10
N_TC	Torque converter speed	TCU1	16	0...FFFEH	0...16383,75 rpm	10
N_TC_RAW	Unfiltered Torque converter turbine speed	TCU2	16	0…FFFEH	0...16383,5 rpm	10
N_TGT_LUP	Target engine speed used in lock-up module	TCU3	8	00H..FEH	500...3040 rpm	10
OBD_FRF_ACK	OBD freeze frame acknowledgement	EMS2	6	0..3FH	Logic	10
%% ObjDisappearing	A target object disappearing signal at low speed range	SCC1	1	0/1	Logic	20
ObjValid	Target object detected	SCC1	1	0/1	Logic	20
Odometer	Odometer–Mileage information	CLU1	24	0... FFFFFFH	0 ... 1,000,000 km	20
ODOMETER_LEFT	Mileage counter for odometer, Left hand	TCS5	4	00H...0EH	0...14 m	20
ODOMETER_LEFT	Mileage counter for odometer, Left hand	ABS1	4	00H...0EH	0...14 m	20
ODOMETER_RIGHT	Mileage counter for odometer, Right hand	TCS5	4	00H...0EH	0...14 m	20
ODOMETER_RIGHT	Mileage counter for odometer, Right hand	ABS1	4	00H...0EH	0...14 m	20
OD_OFF_REQ	Over drive off request to TCU	EMS2	1	0/1	Logic	10
PAS_Seat_Belt	Passenger Seat Belt On/Off Status	CLU2	2	0..03H	Logic	100
PBRAKE_ACT	Parking brake active	TCS3	1	0/1	Logic	20
PIC_Lock	PIC passive access lock for door module	CLU2	3	00H..07H	0~7	100
PIC_Unlock	PIC passive access unlock for door module	CLU2	3	00H..07H	0~7	100
PID_03h	Freeze Frame - Fuel Control System Status	EngFrzFrm1	16	-	Logic	10
PID_04h	Freeze Frame - Calculated LOAD value	EngFrzFrm1	8	00..FFH	0..100%	10
PID_05h	Freeze Frame - Engine coolant temperature	EngFrzFrm1	8	00..FFH	-40...+215°C	10
PID_06h	Freeze Frame - Short Term Fuel Trim Bank1	EngFrzFrm2	8	00..FFH	-100..99.22%	10
PID_07h	Freeze Frame - Long Term Fuel Trim Bank1	EngFrzFrm2	8	00..FFH	-100..99.22%	10
PID_08h	Freeze Frame - Short Term Fuel Trim Bank2	EngFrzFrm2	8	00..FFH	-100..99.22%	10
PID_09h	Freeze Frame - Long Term Fuel Trim Bank2	EngFrzFrm2	8	00..FFH	-100..99.22%	10
PID_0Bh	Freeze Frame - Manifold Absolute Pressure	EngFrzFrm2	8	00..FFH	0 .. 255 kPa	10

PID_0Ch	Freeze Frame - Engine RPM	EngFrzFrm1	16	0..FFFFH	0 .. 16383.75 rpm	10
PID_0Dh	Freeze Frame - Vehicle speed sensor	EngFrzFrm1	8	00..FFH	0..255 km/h	10
PID_11h	Freeze Frame - Absolute throttle position	EngFrzFrm1	8	00..FFH	0..100%	10
PID_23h	Freeze Frame - Fuel Pressure	EngFrzFrm2	8	00..FFH	0 .. 655350kpa	10
POS_FL_W_LAMP	FL POSITION Warning lamp	TPMS1	1	0/1	Logic	50
POS_FR_W_LAMP	FR POSITION Warning lamp	TPMS1	1	0/1	Logic	50
POS_RL_W_LAMP	RL POSITION Warning lamp	TPMS1	1	0/1	Logic	50
POS_RR_W_LAMP	RR POSITION Warning lamp	TPMS1	1	0/1	Logic	50
PreFill	Prefilling of brake system requested by SCC	SCC1	1	0/1	Logic	20
PRE_FUEL_CUT_IN	Indication of fuel cut in previous to stop fuel cut off	EMS6	1	0/1	Logic	10
PROPEL_F_4WD	Front propeller shaft speed	4WD2	8	0..FEH	0..2540 Hz	20
PROPEL_R_4WD	Rear propeller shaft speed	4WD2	8	0..FEH	0..2540 Hz	20
PUC_STAT	Engine in fuel cut off	EMS1	1	0/1	Logic	10
PV_AV_CAN	Accelerator Pedal value	EMS2	8	00..FEH	0..99.2 %	10
QECACC	Failure in SCC message detected by engine control	EMS5	1	0/1	Logic	10
RATIO_TQI_BAS_MAX_STND	Standard Torque Ratio	EMS1	8	0..FFH	0...2	10
REQ_Damping	Requested damping mode	ECS1	2	0..03H	Logic	50
REQ_EPB_ACT	ESC Requests to EPB	ESP1	2	0..03H	Logic	20
REQ_Height	Requested level by ECS switch	ECS1	2	0..03H	Logic	50
REQ_level	Requested level by ECS switch or automatic	ECS1	4	0..0FH	0~15	50
REQ_RESPONSE	Request response of ECUs	GST1	8	0..01H	Logic	-
RKE_CMD	Keyless command	CLU2	3	00H..07H	0~7	100
RLSS	Rear left speed sensor	4WD2	8	0..FEH FFH	0..254 km/h Fault	20
RLY_AC	Activation, air conditioner compressor relay	EMS1	1	0/1	Logic	10
R_NEngIdlTgC	Engine Idle Target Speed	EMS_H2	8	00H..FFH	0..2550rpm	10
ROL_CNT_ESP	Message rolling counter for monitoring	ESP1	8	0..FFH	0…255	20
R_PAcnC	APT Sensor output value	EMS_H2	8	0hPa... 31,750 hPa	000H .. 0FEH	10
RRSS	Rear right speed sensor	4WD2	8	0..FEH FFH	0..254 km/h Fault	20
R_TIRE	Dynamic radius of a tire	4WD1	8	00H.. FFH	200 ... 455 mm	20
R_TqAcnApvC	Max torque limitation of A/C compressor	EMS_H2	8	00H .. FEH	0 Nm..25.4 Nm	10

R_TqAcnOutC	Calculated A/C Comp. Torque	CLU1	8	00H .. FEH	0 Nm..50.8 Nm	20
SA_COUNT	Streering Angle Count Value	TCS2	16	0..FFFEH FFFFH	-1430°~1430° Fault	20
SA_Z_COUNT	Streering Angle Count Value at Zero point	TCS2	15	0..7FFFH	0°	20
SA_Z_FLAG	Flag which indicates Zero point	TCS2	1	0/1	Logic	20
SAS_Angle	Steering wheel angle	SAS1	16	0...7FFEH 7FFFH	Logic	10
SAS_CAL	SAS internal status	SAS1	1	0/1	Logic	10
SAS_CID	SAS1-CAN transmit identifier	CAL_SAS	11	02B0H	02B0H	Event
SAS_OK	SAS internal status	SAS1	1	0/1	Logic	10
SAS_Speed	Steering wheel speed	SAS1	8	0..FEH FFH	0~1016 ° /s Fault	10
SAS_Trim	SAS internal status	SAS1	1	0/1	Logic	10
SID	Requested service ID	GST1	8	0..FFH	Logic	-
SLD_VS	Speed limiter vehicle speed	EMS_H2	8	0..FEH FFH	0..254 km/h Fault	10
SLOPE_TCU	Calculated road gradient	TCU3	6	00H..3FH	-16..15.5[%]	10
SOAK_TIME	Engine soaking time	EMS6	8	00H .. 0FFH	0..255 Min	10
SOAK_TIME_ERROR	Soak time error	EMS6	1	0/1	Logic	10
SPEED_UNIT	Kind of vehicle speed unit	CLU1	1	00H … FEH	0 ... 254 km/h or MPH	20
SPK_RTD_TCU	Requested spark retard angle from TCU	TCU2	8	17..3FH / 40..67H	-15 ° ... 0 ° / 0.375 ° . 15 °	10
SPK_TIME_CUR	Current spark timing	EMS6	8	00..5FH / 60..FFH	-35.625 ° .. 0 ° / 0.375 ° .. 60 °	10
StandStill	Offset determination of yaw rate	TCS3	1	0/1	Logic	20
STATE_DC_OBD	Status for rate-based monitoring conditions	EMS5	7	0..3F	Logic	10
Ster_Pos	Steering wheel position	4WD2	16	0..FFFFH	-600°~600°	20
SWI_CC	Converter clutch	TCU1	2	0..3H	Logic	10
SWI_GS	Gear shift active	TCU1	1	0/1	Logic	10
SWI_IGK	Ignition key switch	EMS1	1	0/1	Logic	10
SYS_NA	System temporary not available	ECS1	1	0/1	Logic	50
TakeOverReq	Take-over request	SCC1	1	0/1	Logic	20
TAR_GC	Target of gear change	TCU1	3	0..7H	Logic	10
TauGapSet	Set time gap	SCC1	2	00 ... 03H	Logic	20
TCO	Coolant temperature	EMS3	8	0..FEH FFH	-48..+142,5°C Fault	10
TCS_CTL	TCS control indication	TCS1	1	0/1	Logic	10

TCS_DEF	TCS defective indication	TCS1	1	0/1	Logic	10
TCS_GSC	TCS gear shift characteristic	TCS1	1	0/1	Logic	10
@@TCS_LAMP	~~TCS/ESC Malfunction Lamp~~ TCS/ESC Function/Warning Lamp	TCS5	2	00 ... 03H	Logic	20
TCS_MFRN	TCS Manufacturer Information	TCS1	1	0/1	Logic	10
TCS_OFF_LAMP	TCS/ESC OFF SW Lamp	TCS5	1	0/1	Logic	20
TCS_PAS	TCS disabled by user	TCS1	1	0/1	Logic	10
TCS_REQ	TCS request	TCS1	1	0/1	Logic	10
TCU_OBD	OBD status of TCU	TCU1	4	0..FH	Logic	10
TCU_STAT	Status TCU	TCU1	1	0/1	Logic	10
TCU_TYPE	TCU type	TCU1	2	0...3	Logic	10
TEMP_AT	A/T fluid temperature	TCU1	8	0..FFH	-40.. 215°C	10
TEMP_ENG	Engine coolant temperature	EMS2	8	0..FEH	-48..+142,5°C	10
TIA	Induction air temperature	EMS3	8	0..FEH FFH	-48..+142,5°C Fault	10
TPMS_W_LAMP	TPMS Malfunction Warning lamp	TPMS1	2	0..3H	Logic	50
TPS	Throttle position signal	EMS2	8	20..F5H	0..100 %	10
TQ_COR_STAT	Status torque correction	EMS1	2	0..3H	Logic	10
TQ_STND	Torque scaling factor (standardization)	EMS2	6	0..3FH	0..630 Nm or 0..945 Nm	10
TQFR	Torque of friction	EMS1	8	0..FFH	0..100% of Mmax	10
TQI	Indicated engine torque	EMS1	8	0..FFH	0..100% of Mmax	10
TQI	Indicated engine torque	EMS6	8	00H .. 0FFH	0..99.6094 % (of TQ_STND)	10
TQI_ACC	Indicated torque command for SCC	TCS3	8	00 ... FFH	0 ... 99,6094 %	20
TQI_ACOR	Engine torque after correction	EMS1	8	0..FFH	0..100% of Mmax	10
TQI_ACOR_J	Flywheel torque (after torque interventions)	EMS4	16	0..FFFFH	-3276.8Nm ~ 3276.7Nm	10
TQI_B	Indicated engine torque	EMS_H2	8	0..FFH	0..99.6094 % (of TQ_STND)	10
TQI_J	Flywheel torque	EMS4	16	0..FFFFH	-3276.8Nm ~ 3276.7Nm	10
TQI_MAX	Maximum indicated engine torque	EMS6	8	00H .. 0FFH	0..99.6094 % (of TQ_STND)	10
TQI_MIN	Minimum indicated engine torque	EMS6	8	00H .. 0FFH	0..99.6094 % (of TQ_STND)	10
TQI_MSR	Torque intervention for control MSR functions, reffered to the indicated engine torque	TCS1	8	0... FFH	0...99.6094%of Mmax	10
TQI_SLW_TCS	Slow torque intervention for TCS function, reffered to theIndicated engine torque	TCS1	8	0...FFH	0...99.6094% of Mmax	10

TQI_TARGET	Target engine torque	EMS6	8	00H .. 0FFH	0..99.6094 % (of TQ_STND)	10
TQI_TCS	TCS requested engine torque	TCS1	8	0..FFH	0..100% of Mmax	10
TQI_TCU	TCU requested engine torque	TCU1	8	0..FFH	0..100% of Mmax	10
TQI_TCU_INC	TCU requested engine RPM increase	TCU1	8	000H .. 0FFH	0..99.6094%	10
TREAD_W_LAMP	TREAD Warning lamp	TPMS1	2	0..3H	Logic	50
TRUNK_OPEN_STATUS	Trunk Latch Switch signal	CLU2	2	0...3H	Logic	100
Vanz	Displayed vehicle speed	CLU1	8	00H … FEH	0 ... 254 km/h or MPH	20
VB	Battery voltage	EMS4	8	0..FEH FFH	0..25.7969 V Fault	10
VB_OFF_ACT	FMY reset after battery disconnected	EMS2	1	0...1H	0...1	10
VS	Vehicle speed	EMS1	8	0..FEH FFH	0..254 km/h Fault	10
VSetDis	Set speed	SCC1	8	0H…FEH	0 ... 254 km/h	20
VS_TCU	Vehicle speed calculated by TCU	TCU2	8	0..FEH FFH	0..254 km/h Fault	10
VS_TCU_DECIMAL	The value below decimal point of vehicle speed	TCU2	8	0..7FH	0..0.9921875 km/h	10
WHEEL_FL	Wheel velocity, front, left-hand	ABS1	12	00H... FFEH	0..511.75 km/h Fault	20
WHEEL_FL	Wheel velocity, front, left-hand	TCS5	12	00H... FFEH	0..511.75 km/h Fault	20
WHEEL_FR	Wheel velocity, front, right-hand	ABS1	12	00H... FFEH	0..511.75 km/h Fault	20
WHEEL_FR	Wheel velocity, front, right-hand	TCS5	12	00H... FFEH	0..511.75 km/h Fault	20
WHEEL_RL	Wheel velocity, rear, left-hand	ABS1	12	00H... FFEH	0..511.75 km/h Fault	20
WHEEL_RL	Wheel velocity, rear, left-hand	TCS5	12	00H... FFEH	0..511.75 km/h Fault	20
WHEEL_RR	Wheel velocity, rear, right-hand	ABS1	12	00H... FFEH	0..511.75 km/h Fault	20
WHEEL_RR	Wheel velocity, rear, right-hand	TCS5	12	00H... FFEH	0..511.75 km/h Fault	20
##WHL_PUL_Chksum	Signal checksum	WHL_PUL	8	00H... FFH	0..255	20
## WHL_PUL_FL	FL Wheel Pulse Count	WHL_PUL	8	00H... FEH	0..127	20
## WHL_PUL_FR	FR Wheel Pulse Count	WHL_PUL	8	00H... FEH	0..127	20
## WHL_PUL_RL	RL Wheel Pulse Count	WHL_PUL	8	00H... FEH	0..127	20
## WHL_PUL_RR	RR Wheel Pulse Count	WHL_PUL	8	00H... FEH	0..127	20
%%WHL_SPD_FL	Wheel speed (high reolution), front, left-hand	WHL_SPD	14	00H... 3FFEH	0 ... 511.9375 km/h	20
%%WHL_SPD_FR	Wheel speed (high reolution), front, right-hand	WHL_SPD	14	00H... 3FFEH	0 ... 511.9375 km/h	20
%%WHL_SPD_RL	Wheel speed (high reolution), rear, left-hand	WHL_SPD	14	00H... 3FFEH	0 ... 511.9375 km/h	20
%%WHL_SPD_RR	Wheel speed (high reolution), rear, right-hand	WHL_SPD	14	00H... 3FFEH	0 ... 511.9375 km/h	20
YAW_RATE	Yaw rate	ESP2	13	00H ... 1FFEH	-40.95 ... +40.95 °/s	10

YAW_RATE_STAT	Yaw rate signal state	ESP2	1	0/1	Logic	10
YAW_RATE_DIAG	Diagnosis mode of yaw rate sensor	ESP2	1	0/1	Logic	10

6. CAN Signal Specification

6.1 Form sheet for definition of a signal

LABEL	Designation	Message	Identifier	Bit add.	Bit ind.
Signal Name	**Signal Description**	**Message Group**	**CAN ID**	**Bit Address**	**No. of Bits**

Signal definition:

Generation of the signal; describes the signal sensing process.
The description includes, amongst others: sampling procedures, filter functions, delay times and signal jitter.

Conversion; represents the procedures executed internally in the control unit to generate the numerical value.

Representation of the numerical value; illustrates the representation of the numerical value, e.g. low-order number on the low-order address (L / H)

Phase relationship; indicates the relationship to other signals.

Circuit schematic for signal conditioning; possibly graphical representation of the physical signal up to the CAN signal.

Functional requirements:

Diagnostic capability; error detection method.

Signal conditioning active; describes the conditions under which the signal is generated.

Initial value: Value prior to beginning of transmission
When a receiving unit detects an erroneous condition of a transceiving unit, the receiving unit should set the value of transceiver's messages to the initial value.

Error identifier: Value on detection of error: identified by:
a) A value outside of the range of values
b) An additional signal which informs that the transmitted value has been generated from a substitute parameter
c) There is no error identification if the transmitted parameter corresponds to a "safe" state.
Regarding substitute parameters which are set by the receiver due to a transmitted error identifier, please refer to the functional description included in the specifications for the receiver in question.

Physical range: Displayable range; allocation of the admissible physical range to the range of values.

Conversion: Conversion into physical values, or allocation of values to logic states.

Receiver of signal and signal features required by the receiver:

Note:

6.2 Signal Description

6.2.1 TCS1 Message

Message: TCS1	Identifier: 0153H

%%

Signal label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
TCS_REQ	Request TCS	0	1	00H	-
MSR_C_REQ	Request for MSR functions	1	1	00H	-
TCS_PAS	TCS disabled by user	2	1	00H	-
TCS_GSC	TCS gear shift characteristic	3	1	00H	-
Reserved	Brake system definition(ABS/TCS/ESC/EHB)	4	2	00H	
ABS_DIAG	ABS/TCS/ESC “diagnostic mode” indication	6	1	00H	-
ABS_DEF	ABS "defective" indication	7	1	00H	-
TCS_DEF	TCS "defective" indication	8	1	00H	-
TCS_CTL	TCS "control" indication	9	1	00H	-
ABS_ACT	ABS "control" indication	10	1	00H	-
EBD_DEF	EBD “defective“ indication	11	1	00H	-
ESP_PAS	ESC disabled by user	12	1	00H	-
ESP_DEF	ESC “defective“ indication	13	1	00H	-
ESP_CTL	ESC "control" indication	14	1	00H	-
TCS_MFRN	TCS Manufacturer Information	15	1	00H	-
DBC_CTL	DBC “control” indication	16	1	00H	-
DBC_PAS	DBC stand by	17	1	00H	-
DBC_DEF	DBC “defective” indication	18	1	00H	-
HAC_CTL	HAC “control” indication	19	1	00H	-
HAC_PAS	HAC stand by	20	1	00H	-
HAC_DEF	HAC “defective” indication	21	1	00H	-
ESS_STAT	ESS system status	22	2	00H	-
TQI_TCS	Torque intervention for TCS functions, referred to the indicated engine torque	24	8	FFH	-
TQI_MSR	Torque intervention for MSR functions, referred to the indicated engine torque	32	8	00H	-
TQI_SLW_TCS	Slow torque intervention for TCS functions, referred to the indicated engine torque	40	8	FFH	-
CF_Esc_LimoInfo	Limo Information of Vehicle	48	2	-	-
Free	free	50	2	00H	-
AliveCounter_TCS1	Alive-counter	52	4	00H	0FH
Checksum_TCS1	Checksum	56	8	00H	-

Memory layout:

Checksum_TCS1								56
AliveCounter_TCS1				Free		CF_Esc_LimoInfo		48
TQI_SLW_TCS								40
TQI_MSR								32
TQI_TCS								24
ESS_STAT		HAC_DEF	HAC_PAS	HAC_CTL	DBC_DEF	DBC_PAS	DBC_CTL	16
TCS_MFRN	ESP_CTL	ESP_DEF	ESP_PAS	EBD_DEF	ABS_ACT	TCS_CTL	TCS_DEF	8
ABS_DEF	ABS_DIAG	Reserved		TCS_GSC	TCS_PAS	MSR_C_REQ	TCS_REQ	0

Transmission parameters - Conditions

System	TCS/ESC
Output period	10 ms
Output period tolerance	± 5 ms
Latency	max. 5 ms
Transmit condition	Power supply via EMS primary relay
Remote operation	no
Message Time out	500ms
Message Validity	IGN1
Phase relationship to another message	no

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
TCS_REQ	**Request TCS**	**TCS1**	**0153H**	**0**	**1**
MSR_C_REQ	**Request MSR functions**	**TCS1**	**0153H**	**1**	**1**
TQI_TCS	**Torque intervention for TCS function, referred to the indicated engine torque**	**TCS1**	**0153H**	**24**	**8**
TQI_MSR	**Torque intervention for MSR functions, referred to the indicated engine torque**	**TCS1**	**0153H**	**32**	**8**
TQI_SLW_TCS	**Slow torque intervention for ESC function, referred to the indicated engine torque**	**TCS1**	**0153H**	**40**	**8**

Signal definition:

Request for an indicated desired engine torque, the combination of signals calls, on the one hand, for a desire for charge reduction (TCS or ESC function), and, on the other hand, for a desire for charge increase (MSR function).

TCS_REQ :
Identifies a TCS control or ESC control intervention. This bit is to prevent the triggering of unintended TCS/ESC interventions.

TQI_TCS :
Torque reduction according to TQI_TCS is accomplished in the EMS by different methodes depending on the type of engine (Diesel, Gasoline, with or without ETC). Possible methodes are the reduction of airflow into the engine cylinders, the ignition angle adjustment and/or shutdown of cylinders and the reduction of injection etc. Torque reduction down to the engine drag torque range has to be possible

TQI_SLW_TCS :
The driving torque reduction according to TQI_SLW_TCS is accomplished in the EMS by reduction of airflow into engine cylinders (electrical throttle control) down to the engine drag torque range.

TCS function:
In the case of a torque reduction, following conditions must be fulfilled. :
TCS_REQ=1, MSR_C_REQ=0, TQI_TCS < 0FFH and TQI_MSR = 00H

MSR_C_REQ :
Identifies an engine drag torque control for which fuel cut off prohibition is specified.

TQI_MSR :
The torque increase according to TQI_MSR is accomplished in the EMS via the idle-charge actuator (limited by the maximum air flow of the idle-charge actuator) or electrical throttle controller (DIESEL : increase of fuel injection) up to the driving torque range.

MSR function :
In the case of a torque increase, following conditions must be fulfilled. :
MSR_C_REQ = 1, TCS_REQ = 0, TQI_MSR > 00H and TQI_TCS = 1's complement of TQI_MSR

The specified torque TQI_x is referred to a maximum torque TQ_STND. From this conversion into a physical quantity results a range of 0..99.6094% for TQ_STND.

If there is no intervention, the passive value is transferred:

TCS_REQ	0H
MSR_C_REQ	0H
TQI_TCS	FFH
TQI_SLW_TCS	FFH
TQI_MSR	00H

There exists a relationship between the signals TQI_TCS, TQI_MSR, TCS_REQ and MSR_C_REQ.

Functional requirements:

Initial value:	Passive values			
Error identifier:	-			
Physical range:	TQI_TCS:	0..99.6094%	=	0H..FFH
	TQI_SLW_TCS :	0..99.6094%	=	0H..FFH
	TQI_MSR :	0..99.6094%	=	0H..FFH
	TCS_REQ:	0..1	=	0H..1H
	MSR_C_REQ :	0..1	=	0H..1H

Conversion:	TQI_TCS:	(PH) = 0.390625 * (HEX) [%]
	TQI_SLW_TCS:	(PH) = 0.390625 * (HEX) [%]
	TQI_MSR:	(PH) = 0.390625 * (HEX) [%]

TCS_REQ	Function
0	Passive
1	TCS/ESC control active

MSR_C_REQ	Function
0	Passive or TCS function
1	MSR control active

Receiver of signal and signal features required by the receiver:

TCU: TCU recognizes the TCS torque intervention level from the signal TQI_TCS.
EMS: intervention on ignition angle, injection and idle speed actuator.

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
TCS_PAS	**TCS disabled by user**	**TCS1**	**0153H**	**2**	**1**
TCS_DEF	**TCS "defective" indication**	**TCS1**	**0153H**	**8**	**1**
TCS_CTL	**TCS "control" indication**	**TCS1**	**0153H**	**9**	**1**

Signal definition:

TCS_PAS:
Information regarding the TCS "enable/disable" indication.

TCS_DEF:
Information regarding the TCS "defective" indication.

TCS_CTL:
Information regarding the TCS "control" indication.

There is no specific phase relationship between the output and any other signal.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H .. 01H

Conversion:

TCS_DEF	TCS_PAS	TCS_CTL	Function
0	0	0	TCS lamp OFF
0	0	1	TCS Active
0	1	x	TCS is disabled by user
1	x	x	TCS is defective (failed)

Receiver of signal and signal features required by the receiver:
TCU, SCC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
TCS_GSC	**TCS gear shift characterisitic**	**TCS1**	**0153H**	**3**	**1**

Signal definition:

Interface signal between TCS/ESC and TCU influencing the TCU switching characteristics in the case of an TCS control system.

There is no specific phase relationship between the output and any other signal.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H .. 01H

Conversion:

TCS_GSC	Function
0	passive (gear change allowed)
1	active (gear change not allowed)

Receiver of signal and signal features required by the receiver:

TCU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ABS_DIAG	**ABS/TCS/ESC "diagnostic mode" indication**	**TCS1**	**0153H**	**6**	**1**

Signal definition:

ABS_DIAG : Information regarding the ABS/TCS/ESC "diagnostic mode" indication.

There is no specific phase relationship between the output and any other signal

Functional requirements:

Initial value : 00H

Error identifier : -

Physical range : -

Conversion:

ABS_DIAG	Function
0	ABS/TCS/ESC is not diagnostic mode
1	ABS/TCS/ESC is diagnostic mode

Receiver of signal and signal features required by the receiver :

CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ABS_DEF	**ABS "defective" indication**	**TCS1**	**0153H**	**7**	**1**

Signal definition:

ABS_DEF:
Information regarding the ABS "defective" indication.

There is no specific phase relationship between the output and any other signal.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H .. 01H

Conversion:

ABS_DEF	Function
0	ABS is not defective
1	ABS is defective

Receiver of signal and signal features required by the receiver:
%%
TCU, EMS, SCC, ACU, SPAS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ABS_ACT	**ABS "Control" Indication**	**TCS1**	**0153H**	**10**	**1**

Signal definition:
ABS controller provides an information on ABS Active signal.

ABS_ACT signal is 1 during the ABS control and if it is not ABS control phase this value is 0.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H .. 01H

Conversion:

ABS_ACT	Function
0	ABS control inactive
1	ABS control active

Receiver of signal and signal features required by the receiver :
%%
TCU, ECS, ACU, PSB, SPAS, EPB

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
EBD_DEF	**EBD "defective" indication**	**TCS1**	**0153H**	**11**	**1**

Signal definition:

EBD_DEF:
Information regarding the EBD „defective" indication.

There is no specific phase relationship between the output and any other signal.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H .. 01H

Conversion:

EBD_DEF	Function
0	EBD is not defective
1	EBD is defective

Receiver of signal and signal features required by the receiver:
%%
TCU, EMS, PSB, SPAS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ESP_PAS	**ESC disabled by user**	**TCS1**	**0153H**	**12**	**1**
ESP_DEF	**ESC "defective" indication**	**TCS1**	**0153H**	**13**	**1**
ESP_CTL	**ESC "control" indication**	**TCS1**	**0153H**	**14**	**1**

Signal Definition :

ESP_PAS :
Information regarding the ESC "enable/disable" indication.

ESP_DEF :
Information regarding the ESC „ defective“ indication.

ESP_CTL :
Information regarding the ESC "control" indication.

There is no specific phase relationship between the output and other signal

Functional requirements:

Initial value : 00H

Error Identifier : -

Physical range : 00H ...01H

Conversion:

ESP_DEF	ESP_PAS	ESP_CTL	Function
0	0	0	ESC lamp OFF
0	0	1	ESC active
0	1	x	ESC disabled by user (SW off)
1	x	x	ESC is defective (failed)

Receiver of signal and signal features required by the receiver:

TCU, SCC, ACU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
TCS_MFRN	**TCS Manufacturer Information**	**TCS1**	**0153H**	**15**	**1**

Signal definition:

TCS manufacturer information to distinguish between a system which requires only TQI_TCS function and a system which requires both TQI_TCS and TQI_SLW_TCS functions. This signal indicates that TCS requests torque reduction using only TQI_TCS or using both TQI_TCS and TQI_SLW_TCS.

If this signal is set to "1", this means that torque reduction method (Throttle Control or Injection Control) is determined by the value of TQI_TCS only. (TQI_SLW_TCS is not used and should be set to FFH)

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H .. 01H

Conversion:

TCS_MFRN	Function
0	Using both TQI_TCS and TQI_SLW_TCS
1	Using TQI_TCS only (Not using TQI_SLW_TCS)

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
DBC_CTL	**DBC “control” indication**	**TCS1**	**0153H**	**16**	**1**
DBC_PAS	**DBC stand by**	**TCS1**	**0153H**	**17**	**1**
DBC_DEF	**DBC “defective” indication**	**TCS1**	**0153H**	**18**	**1**

Signal Definition :

DBC_CTL :
This signal indicates the information regarding the DBC “control” indicator

DBC_PAS :
This signal indicates the information regarding the DBC “enable/disable” indicator

DBC_DEF :
This signal indicates the information regarding the DBC “defective” indicator

Functional requirements:

Initial value : 00H

Error Identifier : -

Physical range : 00H ...01H

Conversion:

DBC_DEF	DBC_PAS	DBC_CTL	Function
0	0	0	DBC is not applied
0	x	1	DBC is Active
0	1	0	DBC is stand by (SW ON)
1	x	x	DBC is defective (failed)

Receiver of signal and signal features required by the receiver:

EMS, TCU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
HAC_CTL	**HAC "control" indication**	**TCS1**	**0153H**	**19**	**1**
HAC_PAS	**HAC stand by**	**TCS1**	**0153H**	**20**	**1**
HAC_DEF	**HAC "defective" indication**	**TCS1**	**0153H**	**21**	**1**

Signal Definition :

HAC_CTL :
This signal indicates the information regarding the HAC "control" indicator

HAC_PAS :
This signal indicates the information regarding the HAC "enable/disable" indicator

HAC_DEF :
This signal indicates the information regarding the HAC "defective" indicator

Functional requirements:

Initial value : 00H

Error Identifier : -

Physical range : 00H ...01H

Conversion:

HAC_DEF	HAC_PAS	HAC_CTL	Function
0	0	0	HAC is not applied
0	x	1	HAC is Active
0	1	0	HAC is stand by (SW ON) If SW is applied
1	x	x	HAC is defective (failed)

Receiver of signal and signal features required by the receiver:

EMS, TCU

Note:

##

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ESS_STAT	**ESS system status**	**TCS1**	**0153H**	**22**	**2**

Signal definition:

Information on ESS system active/inactive/fail from ABS/ESC.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H .. 03H

Conversion:

ESS_STAT	Function
00H	ESS control “inactive” (Normal condition)
01H	ESS control “active” (Emergency stop condition)
02H	ESS system is defective
03H	Reserved

Receiver of signal and signal features required by the receiver:

CLU, EMS

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Esc_LimoInfo	**Limo Information of Vehicle**	**TCS1**	**0153H**	**48**	**2**

Signal definition:

The signal indicates a vehicle information to distinguish between Limo and not Limo.

Functional requirements:

Initial value: 00H / 01H

Error identifier: Same as Initial value

Physical range: 00H .. 03H

Conversion:

CF_Esc_LimoInfo	Function	Detail
00H	Invalid	Vehicle is not defined. e.g. While init phase, EEPROM coding error is detected,…
01H		
02H	Vehicle is not Limo	
03H	Vehicle is Limo	

Receiver of signal and signal features required by the receiver:

SCC

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
AliveCounter_TCS1	**Alive-counter**	**TCS1**	**0153H**	**52**	**4**

Signal definition:

Alive-counter which is increasing every loop.
The alive-counter becomes 00H at the next loop when it is 0EH

Functional requirements:

Initial value: 00H

Error identifier: 0FH

Physical range: 00 ... 0EH

Conversion: (PH) = 1 * (HEX)

Receiver of signal and signal features required by the receiver:

EMS, EPB

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
Checksum_TCS1	**Checksum**	**TCS1**	**0153H**	**56**	**8**

Signal definition:

This value is used to check the TCS1 message is correctly transmitted.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: -

Conversion: (PH) = Byte(Byte0 + Byte1 + Byte2 + Byte3 + Byte4 + Byte5 + Byte6)

Receiver of signal and signal features required by the receiver:

EMS, EPB

Note:

6.2.2 TCS2 Message

Message: TCS2	Identifier: 01F0H

Signal Label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
SA_COUNT	Streering Angle Count Value	0	16	4000H	FFFFH
SA_Z_COUNT	Streering Angle Count Value at Zero point	16	15	0000H	-
SA_Z_FLAG	Flag which indicates Zero point	31	1	00H	-

Memory layout:

SA_Z_FLAG	SA_Z_COUNT(high)	24
SA_Z_COUNT(low)		16
SA_COUNT (high)		8
SA_COUNT (low)		0

Transmission parameters - Conditions

System	TCS / ESC
Output period	20 ms
Output period tolerance	± 5 ms
Latency	max. 5 ms
Transmit Condition	Power supply via EMS primary relay
Remote operation	no
Message Time out	500ms
Message Validity	IGN1
Phase relationship to another message	no

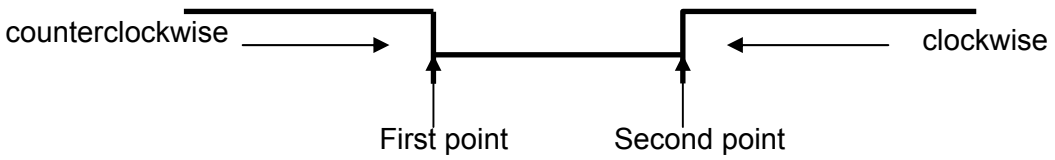
LABEL	Designation	Message	Identifier	Bit add.	Bit lnd.
SA_COUNT	**Streering Angle Count Value**	**TCS2**	**01F0H**	**0**	**16**
SA_Z_COUNT	**Streering Angle Count Value at Zero point**	**TCS2**	**01F0H**	**16**	**15**
SA_Z_FLAG	**Flag which indicates Zero point**	**TCS2**	**01F0H**	**31**	**1**

Signal definition:

ESC controller provides an information on steering angle value.

SA_COUNT provides the present steering angle value. This value also indicates the relative angle.
When the steering wheel angle changes in the clockwise direction this value is decreased and when the steering wheel angle changes in the counterclockwise direction this value is increased by the standard of initial value.

SA_Z_COUNT provides the steering angle value at zero point.
This value is detected only once when the steering wheel passes the zero point for the first time.
Also SA_Z_FLAG is set simultaneously.
Detection point is at falling edge.
When the steering wheel angle changes in the counterclockwise direction this is the value of the first point and when the steering wheel angle changes in the clockwise direction this is the value of the second point.



SA_Z_FLAG is set when steering wheel passes the zero point and remains until ignition is turned off.

Functional requirements for wheel velocities:

SA_COUNT

Initial value :	4000H	
Error identifier :	FFFFH	
Physical range :	+1430° = 42CBH	(left end)
	0° = 4000H	(voluntary zero point value)
	-1430° = 3D35H	(right end)
Conversion :	(PH) = 2 * (HEX – 4000H) [°]	

SA_Z_COUNT

Initial value :	0000H	
Error identifier :	-	
Physical range :	0° = xxxxH	(actual zero point value)
Conversion :	(PH) = 2 * (HEX – 4000H) [°]	
	(deviation angle between actual zero point value and voluntary zero point value)	

SA_Z_FLAG

Initial value : 00H
Error identifier : -
Physical range : 0 .. 1 = 00H .. 01H

Conversion:

SA_Z_FLAG	Function
0	No zero point detection
1	Zero point detection

Receiver of signal and signal features required by the receiver :
4WD, ACU

Note

*** These signals are for the Non-CAN Type Streering Angle Sensor ONLY and appllied to 4WD (electronic 4WD) vehicles.**

6.2.3 TCS3 Message

Message: TCS3	Identifier: 0430H

Signal Label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
aBasis	Acceleration for initialization	0	11	000H	7FFH
BrakeLight	Brake light activation during automatic braking	11	1	00H	-
DCEnable	Enable deceleration control	12	1	00H	-
AliveCounterTCS	Alive rolling counter	13	3	00H	-
MinGear	Requested gear lower limit	16	3	00H	-
MaxGear	Requested gear upper limit	19	3	00H	-
ACCReqLim	SCC Request Limited	22	2	00H	-
TQI_ACC	Indicated torque command for SCC	24	8	00H	-
ACCEL_REF_ACC	Vehicle acceleration	32	11	000H	7FFH
ACCEnable	SCC acceleration/deceleration requests enabled	43	2	00H	-
DriverOverride	Driver is requesting more acceleration/deceleration than SCC	45	2	00H	-
StandStill	Offset determination of yaw rate	47	1	00H	-
Checksum_TCS3	Signal checksum	48	4	00H	-
ACC_EQUIP	SCC Option Description	52	1	-	-
PBRAKE_ACT	Parking brake active	53	1	00H	-
ACC_REQ	Request SCC torque command	54	1	00H	-
DriverBraking	Indication of brake pedal activation	55	1	00H	-
Free	Free	56	8	00H	-

Memory layout:

Free						56
Driver Braking	ACC_REQ	PBRAKE _ACT	ACC_E QUIP	Checksum_TCS3		48
StandStill	DriverOverride		ACCEnable	ACCEL_REF_ACC (MSB 3bit)		40
ACCEL_REF_ACC						32
TQI_ACC						24
ACCReqLim	MaxGear			MinGear		16
AliveCounterTCS	DCEnable		BrakeLight	aBasis (MSB 3bit)		8
aBasis (LSB)						0

Transmission parameters - Conditions

System	TCS / ESC
Output period	20 ms
Output period tolerance	± 5 ms
Latency	max. 5 ms
Transmit Condition	Power supply via EMS primary relay
Remote operation	no
Message Time out	500ms
Message Validity	IGN1
Phase relationship to another message	no

***NOTE : This message is for the "SCC" or "DBC" or "HAC" system applied vehicles only.**

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
aBasis	**Accelaration for initialization**	**TCS3**	**0430H**	**0**	**11**

Signal definition:

This value is used to initialize the acceleration control when SCC is engaged or after driver override.

Functional requirements:

Initial value: 000H

Error identifier: 7FFH

Physical range: -10.23 ... +10.23 m/s^2 = 00H ... 7FEH

Conversion : (PH) = (0.01 * (HEX)) – 10.23 [m/s^2]

Receiver of signal and signal features required by the receiver:
SCC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
BrakeLight	**Brake light activation during automatic braking**	**TCS3**	**0430H**	**11**	**1**

Signal definition:

Flag from TCS which activates the illumination of the brake lights during automatic braking.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H ... 01H

Conversion:

BrakeLight	Function
0	No request
1	Activate brake lights

Receiver of signal and signal features required by the receiver:
EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
DCEnable	**Enable deceleration control**	**TCS3**	**0430H**	**12**	**1**

Signal definition:

DCEnable:
This signal enables the deceleration control to accept command values *axvCv* from SCC. This flag is complementary to the ACC_REQ flag if SCC is in active mode.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H ... 01H

Conversion:

DCEnable	Function
0	Disable deceleration control
1	Enable deceleration control

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
AliveCounterTCS	**Message counter**	**TCS3**	**0430H**	**13**	**3**

Signal definition:

This signal is incremented with each TCS3 message sent. This signal enables subsystems which are using signals from TCS3 to check whether the TCS3 message is updated or not.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 07H

Conversion: (PH) = 1 * (HEX)

Receiver of signal and signal features required by the receiver:

EMS, SCC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
MinGear	**Requested gear lower limit**	**TCS3**	**0430H**	**16**	**3**

Signal definition:

MinGear:
With MinGear the TCS can command the lowest gear that the transmission can shift to.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0 ... 7

Conversion:

MinGear	Function
0H	No request
1H	1st Gear
2H	2nd Gear
3H	3rd Gear
4H	4th Gear
5H	5th Gear
6H	6th Gear
7H	7th Gear

Receiver of signal and signal features required by the receiver:
TCU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
MaxGear	**Requested gear upper limit**	**TCS3**	**0430H**	**19**	**3**

Signal definition:

MaxGear:
With MaxGear the TCS can command the highest gear that the transmission can shift to.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0 ... 7

Conversion:

MaxGear	Function
0H	No request
1H	1st Gear
2H	2nd Gear
3H	3rd Gear
4H	4th Gear
5H	5th Gear
6H	6th Gear
7H	7th Gear

Receiver of signal and signal features required by the receiver:
TCU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ACCReqLim	**SCC Request Limited**	**TCS3**	**0430H**	**22**	**2**

Signal definition:

Due to limitaion of the actuators the acceleration or deceleration request from SCC can not be processed or only partly.

Examples:

- SCC is requesting more acceleration than the engine can deliver.
- SCC is requesting deceleration on a low μ surface.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H ... 03H

Conversion:

ACCReqLim	Function
00H	No Request
01H	Limited No Limitation
02H	Acceleration Limited
03H	Deceleration Limited

Receiver of signal and signal features required by the receiver:
SCC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
TQI_ACC	**Indicated torque command for SCC**	**TCS3**	**0430H**	**24**	**8**
ACC_REQ	**Request SCC torque command**	**TCS3**	**0430H**	**54**	**1**

Signal definition:

TQI_ACC :
The indicated torque command TQI_ACC is the basic control path to the engine power control. This command has the same priority in the torque-structure than the driver's demand torque. The maximum value of either TQI_ACC or the driver torque is selected for further calculation. All other internal or external torque command values have higher priority.
In order to avoid abrupt torque changes the command value should be limited in engine control

TQI_ACC [Nm] = (TQI_ACC [%] – TQFR[%]) * TQ_STND[Nm]

ACC_REQ :
When it is set, the signal indicates that ESC requests engine torque control for SCC. When the signal is set, EMS should not conduct fuel-cut off control unless it is required to prevent the damage of the engine and the related components.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: TQI_ACC: 0 ... 99,6094 % = 00 ... FFH
ACC_REQ 0…1 = 00 ... 01H

Conversion: TQI_ACC: (PH) = 0,390625 * (HEX) [%]

ACC_REQ	Function
0	No request
1	Enable SCC torque request

E.g. : If TQI_ACC = FFH, then TQI_ACC (PH) = (0.390625 * FFH) %= 99.6094% of TQ_STND

Receiver of signal and signal features required by the receiver:
EMS

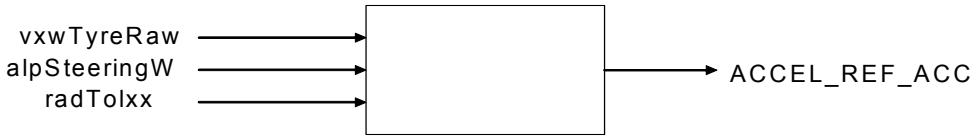
Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ACCEL_REF_ACC	**Vehicle Acceleration**	**TCS3**	**0430H**	**32**	**11**

Signal definition:

The vehicle acceleration ACCEL_REF_ACC displays the feedback signal for the inner acceleration control loop since it is the SCC-internal acceleration command value. In addition this signal is used to calculate the target object acceleration. If the requirements demanded from this signal can't be guaranteed then SCC must be informed and SCC has to be switched off.

Alternatively SCC may calculate the vehicle acceleration itself. Then the wheel speed vxvTyrexx (or the wheel speed row signals vxvTyreRawxx and the wheel tolerances radTolxx of below diagram) should be transmitted by TCS or ESC.



Functional requirements:

Initial value: 000H

Error identifier: 7FFH

Physical range: -10.23 ... +10.23 m/s^2 = 00H ... 7FEH

Conversion : (PH) = (0.01 * (HEX)) – 10.23 [m/s^2]

Receiver of signal and signal features required by the receiver:
SCC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ACCEnable	**SCC acceleration/deceleration requests enabled**	**TCS3**	**0430H**	**43**	**2**

Signal definition:

This signal is set by the safety logic in the TCS/ESC. The safety logic shall monitor the following:

- A temporary failure in the vehicle does not allow SCC (Brakes are overheated, etc…). SCC is disabled reversible.
- SCC communication failure (timeout of SCC message, inconsistency in data or failure in alive counter). SCC is disabled irreversible.
- The average acceleration during a certain time span exceeds a certain threshold. SCC is disabled irreversible.
- The average deceleration during a certain time span exceeds a certain threshold. SCC is disabled irreversible.

SCC shall not be disabled as a response to a failure information received from SCC.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H ... 03H

Conversion:

ACCEnable	Function
00H	SCC enabled
01H	SCC disabled reversible
02H	SCC disabled irreversible
03H	SCC disabled irreversible due to communication error

Receiver of signal and signal features required by the receiver:
SCC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
DriverOverride	**Driver requests more acceleration / deceleration than SCC**	**TCS3**	**0430H**	**45**	**2**

Signal definition:

This signal indicates that acceleration or deceleration value of driver's requirement is greater than SCC setting value.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H ... 03H

Conversion:

DriverOverride	Function
00H	No override
01H	Override by acceleration pedal
02H	Override by deceleration
03H	Not defined

Receiver of signal and signal features required by the receiver:
SCC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
StandStill	**Offset determination of yaw rate**	**TCS3**	**0430H**	**47**	**1**

Signal definition:

If an ESC uses active wheel speed sensors, wheel speeds down to 0 Km/h can be measured. And at 0 Km/h a StandStill flag is set in the ESC. This signal is used in the offset determination of the yaw rate and shall indicate that the vehicle has come to a complete stop.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 01H

Conversion:

StandStill	Function
00H	No stand still detected
01H	stand still detected

Receiver of signal and signal features required by the receiver:

SCC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
Checksum_TCS3	**Signal checksum**	**TCS3**	**0430H**	**48**	**4**

Signal definition:

This value is used to check the TCS3 message is correctly transmitted.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0H ... FH

Conversion: (PH) = 10H – (Least Significant Nibbles of (Byte0 + Byte1 + Byte2 + Byte3 + Byte 4 + Byte5) + Most Significant Nibbles of (Byte0 + Byte1 + Byte2 + Byte3 + Byte4 + Byte5 + Byte6))

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ACC_EQUIP	**SCC Option Description**	**TCS3**	**0430H**	**52**	**1**

Signal definition:

This value is used for SCC is equipped or not.

Functional requirements:

Initial value: -

Error identifier: -

Physical range: 00H ... 01H

Conversion:

ACC_EQUIP	Function
00H	SCC is not equipped
01H	SCC is equipped

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
PBRAKE_ACT	**Indication of parking brake active**	**TCS3**	**0430H**	**53**	**1**

Signal definition:

This signal indicates whether the parking brake is activated or not.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H ... 01H

Conversion:

PBRAKE_ACT	Function
00H	Parking brake is not activated
01H	Parking brake is activated

Receiver of signal and signal features required by the receiver:
SCC

Note:
Update Period : 100 ms

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
DriverBraking	**Indication of brake pedal activation**	**TCS3**	**0430H**	**55**	**1**

Signal definition:

This signal indicates that a driver is pressing the brake pedal or not.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H ... 01H

Conversion:

DriverBraking	Function
0	Brake pedal not pressed
1	Brake pedal pressed

Receiver of signal and signal features required by the receiver:
SCC, EMS

Note:

6.2.4 TCS4 Message

Message: TCS4	Identifier: 04D0H

Signal label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
4WD_OPEN	4WD fast opening of cardan shaft clutch	0	2	00H	03H
4WD_LIM_REQ	Request duty limit of rear wheel of 4WD	2	1	00H	-
4WD_LIM_MODE	4WD transmission torque limitation mode selection	3	1	00H	-
Free	Free	4	4	00H	-
4WD_TQC_LIM	4WD cardan shaft torque limit	8	16	FAFFH	FFFFH
4WD_CLU_LIM	4WD clutch duty limit	24	8	00H	FFH

Memory layout: :

4WD_CLU_LIM				24
4WD_TQC_LIM (high)				16
4WD_TQC_LIM (low)				8
Free	4WD_LIM _MODE	4WD_LIM _REQ	4WD_OPEN	0

Transmission parameters - Conditions

Message	TCS4
System	ESC/ABS
Output period	20 ms
Output period tolerance	± 5 ms
Latency	max. 5 ms
Transmit condition	Power supply via EMS primary relay
Remote operation	No
Message Time out	500ms
Message Validity	IGN1
Phase relationship to another message	No

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
4WD_OPEN	**demands fast opening of the 4WD cardan shaft clutch**	**TCS4**	**04D0H**	**0**	**2**

Signal definition:

Interface signal between ESC and 4WD, demands fast opening or torque limit of the 4WD cardan shaft clutch.

Functional requirements:

Initial value: 00H

Error identifier: 03H

Physical range: 00 ... 03H

Conversion:

4WD_OPEN	Function
00H	Passive (Clutch not influenced by ABS/TCS/ESC and 4WD_TQC_LIM = FAFFH)
01H	Clutch off (Fast opening of 4WD cardan shaft clutch demanded by ABS/TCS/ESC and 4WD_TQC_LIM = 00H)
02H	Torque limit (Required by ABS/TCS/ESC and 4WD_TQC_LIM = 00H…FAFFH)
03H	Error (Control function disabled due to error detection by ABS/TCS/ESC and 4WD_TQC_LIM = FFFFH. In this state, a vehicle should behave like a 2WD vehicle)

Receiver of signal and signal features required by the receiver:

4WD

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
4WD_LIM_REQ	**Request duty limit of rear wheel of 4WD**	**TCS4**	**04D0H**	**2**	**1**

Signal definition:

This signal indicates that ESC request 4WD ECU to limit control duty of rear wheels for improvement of stability of a vehicle during ESC control.

Functional requirements :

Initial value : 00H

Physical range : 0 … 1 = 00H .. 01H

Conversion :

4WD_LIM_REQ	Function
0	No request from ESC
1	Request duty limit from ESC

Receiver of signal and signal features required by the receiver :

4WD

Note:

※This signal is for MANDO TCS/ESC system only.

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
4WD_LIM_MODE	**4WD transmission torque limitation mode selection**	**TCS4**	**04D0H**	**3**	**1**

Signal definition:

This signal indicates that Interface signal between ESC and 4WD, selecting cardan shaft torque limitation mode of 4WD.

Functional requirements :

Initial value : 00H

Physical range : 0 … 1 = 00H .. 01H

Conversion :

4WD_LIM_MODE	Function
0	Maximum limitation mode
1	Minimum limitation mode

Receiver of signal and signal features required by the receiver :

4WD

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
4WD_TQC_LIM	**4WD cardan shaft torque limit**	**TCS4**	**04D0H**	**8**	**16**

Signal definition:

Interface signal between ABS/TCS/ESC and 4WD, demands 4WD cardan shaft torque limit.

Functional requirements:

Initial value: FAFFH (4WD cardan shaft torque not limited by ESC)

Error identifier: FFFFH

Physical range: 0 ... 64255 Nm = 0000H ... FAFFH

Conversion : (PH) = 1 * (HEX) [Nm]

Receiver of signal and signal features required by the receiver:

4WD

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
4WD_CLU_LIM	**4WD clutch duty limit**	**TCS4**	**04D0H**	**24**	**8**

Signal definition:

Interface signal between ABS/TCS/ESC and 4WD and demands 4WD clutch duty limit.

Functional requirements:

Initial value: 00H (Clutch duty not limited by ESC)

Error identifier: FFH

Physical range: 0.390625 ... 99.2188 % = 01H ... FEH

Conversion : (PH) = 0.390625 * (HEX) [%]

Receiver of signal and signal features required by the receiver:

4WD

Note:

6.2.5 TCS5 Message

Message: TCS5	Identifier: 01F1H

@@

Signal label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
ABS_W_LAMP	ABS Warning lamp	0	1	00H	-
EBD_W_LAMP	EBD Warning lamp	1	1	00H	-
TCS_OFF_LAMP	TCS/ESC OFF SW Lamp	2	1	00H	-
TCS_LAMP	~~TCS/ESC Malfunction Lamp~~ TCS/ESC Function/Warning Lamp	3	2	00H	-
DBC_W_LAMP	DBC Warning lamp	5	1	00H	-
DBC_F_LAMP	DBC Function lamp	6	2	00H	-
ODOMETER_LEFT	Mileage counter for odometer, Left hand	8	4	00H	0FH
ODOMETER_RIGHT	Mileage counter for odometer, Right hand	12	4	00H	0FH
WHEEL_FL	Wheel velocity, front, left-hand	16	12	000H	FFFH
WHEEL_FR	Wheel velocity, front, right-hand	28	12	000H	FFFH
WHEEL_RL	Wheel velocity, rear, left-hand	40	12	000H	FFFH
WHEEL_RR	Wheel velocity, rear, right-hand	52	12	000H	FFFH

Memory layout:

WHEEL_RR (MSB)						56
WHEEL_RR (LSB)			WHEEL_RL (MSB)			48
WHEEL_RL (LSB)						40
WHEEL_FR (MSB)						32
WHEEL_FR (LSB)			WHEEL_FL (MSB)			24
WHEEL_FL (LSB)						16
ODOMETER_RIGHT			ODOMETER_LEFT			8
DBC_F_LAMP	DBC_W_LAMP	TCS_LAMP	TCS_OFF_LAMP	EBD_W_LAMP	ABS_W_LAMP	0

Transmission parameters - Conditions

System	TCS/ESC
Output period	20 ms
Output period tolerance	± 5 ms
Latency	max. 5 ms
Transmit condition	Power supply via EMS primary relay
Remote operation	no
Message Time out	500ms
Message Validity	IGN1
Phase relationship to another message	no

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ABS_W_LAMP	**ABS Warning lamp**	**TCS5**	**01F1H**	**0**	**1**

Signal definition:

ABS_W_LAMP : The signal indicates the status of the “ABS Warning lamp”

There is no specific phase relationship between the output and any other signal

Functional requirements:

Initial value : 00H

Error identifier : -

Physical range : -

Conversion:

ABS_W_LAMP	Function
0	ABS Warning lamp OFF
1	ABS Warning lamp ON

Receiver of signal and signal features required by the receiver :

CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
EBD_W_LAMP	**EBD Warning lamp**	**TCS5**	**01F1H**	**1**	**1**

Signal definition:

EBD_W_LAMP : The signal indicates the status of the “EBD Warning lamp”

There is no specific phase relationship between the output and any other signal

Functional requirements:

Initial value : 00H

Error identifier : -

Physical range : -

Conversion:

EBD_W_LAMP	Function
0	EBD Warning lamp OFF
1	EBD Warning lamp ON

Receiver of signal and signal features required by the receiver :

CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
TCS_OFF_LAMP	**TCS/ESC OFF SW Lamp**	**TCS5**	**01F1H**	**2**	**1**

Signal definition:

The signal indicates the status of the “TCS/ESC OFF SW Lamp”
There is no specific phase relationship between the output and any other signal

Functional requirements:

Initial value : 00H

Error identifier : -

Physical range : -

Conversion:

TCS_OFF_LAMP	Function
0	TCS/ESC OFF SW Lamp OFF
1	TCS/ESC OFF SW Lamp ON

Receiver of signal and signal features required by the receiver :

CLU, ACU

Note:

@@

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
TCS_LAMP	**TCS/ESC Function/Warning Lamp**	**TCS5**	**01F1H**	**3**	**2**

Signal definition:

The signal indicates the status of the “TCS/ESC ~~Malfunction~~ Function/Warning Lamp”
There is no specific phase relationship between the output and any other signal

Functional requirements:

Initial value : 00H

Error identifier : -

Physical range : -

Conversion:

TCS_LAMP	Function
00H	TCS/ESC ~~Malfunction~~ Function/Warning Lamp OFF
01H	TCS/ESC ~~Malfunction~~ Function/Warning Lamp ON
02H	TCS/ESC ~~Malfunction~~ Function/Warning Lamp BLINKING(2Hz)
03H	Reserved

Receiver of signal and signal features required by the receiver :

CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
DBC_W_LAPM	**DBC Warning lamp**	**TCS5**	**01F1H**	**5**	**1**

Signal definition:

DBC_W_LAMP : The signal indicates the status of the “DBC Warning lamp”

There is no specific phase relationship between the output and any other signal

Functional requirements:

Initial value : 00H

Error identifier : -

Physical range : -

Conversion:

DBC_W_LAMP	Function
00H	DBC Warning lamp OFF
01H	DBC Warning lamp ON

Receiver of signal and signal features required by the receiver :

CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
DBC_F_LAMP	**DBC Function lamp**	**TCS5**	**01F1H**	**6**	**2**

Signal definition:

DBC_F_LAMP : The signal indicates the status of the “DBC Function lamp”

There is no specific phase relationship between the output and any other signal

Functional requirements:

Initial value : 00H

Error identifier : -

Physical range : -

Conversion:

DBC_F_LAMP	Function
00H	DBC Function lamp OFF
01H	DBC Function lamp ON
02H	DBC Function lamp BLINKING(2Hz)
03H	Reserved

Receiver of signal and signal features required by the receiver :

CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ODOMETER_LEFT	**Mileage counter for odometer, Left hand**	**TCS5**	**01F1H**	**8**	**4**
ODOMETER_RIGHT	**Mileage counter for odometer, Right hand**	**TCS5**	**01F1H**	**12**	**4**

Signal definition:

This signal indicates mileage counter of driven wheels. ESC(TCS) system calculates driven wheels' mileage of 1m resolution and sends it to a cluster.
If the mileage is greater than 14m then ESC(TCS) should count again form 0m.
A cluster adds up total mileage using this signal and displays mileage to its odometer.

Functional requirements:

Initial value: 00H

Error identifier: 0FH

Physical range: 0…14m = 00H...0EH

Conversion (PH) = 1 * (HEX) [m]

Receiver of signal and signal features required by the receiver:

CLU

Note:
※ This signal will be not supported for all vehicles [started with AM ('08. 9/15)]

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
WHEEL_FL	**Wheel velocity, front, left-hand**	**TCS5**	**01F1H**	**16**	**12**
WHEEL_FR	**Wheel velocity, front, right-hand**	**TCS5**	**01F1H**	**28**	**12**
WHEEL_RL	**Wheel velocity, rear, left-hand**	**TCS5**	**01F1H**	**40**	**12**
WHEEL_RR	**Wheel velocity, rear, right-hand**	**TCS5**	**01F1H**	**52**	**12**

Signal definition:

These signals provides the wheel velocity of each wheel and have 12 bits length and a resolution of 0.125 km/h.
In case of failure of one wheel speed sensor, the value FFFH is used as error identifier.

Functional requirements for wheel velocities**:**

Initial value: 000H

Error identifier: FFFH

Physical range: 0 ... 511.75 km/h = 00H... FFEH

Conversion: (PH) = 0.125 * (HEX) [km/h]

Receiver of signal and signal features required by the receiver:
%%
EMS, TCU, 4WD, CLU, PGS, EPB

Note:

6.2.6 ABS1 Message

Message: ABS1	Identifier: 0580H

##

Signal label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
ABS_DEF	ABS "defective" indication	0	1	00H	-
EBD_DEF	EBD "defective“ indication	1	1	00H	-
ABS_ACT	ABS “control“ indication	2	1	00H	-
ABS_W_LAMP	ABS Warning lamp	3	1	00H	-
EBD_W_LAMP	EBD Warning lamp	4	1	00H	-
ABS_DIAG	ABS “diagnostic mode” indication	5	1	00H	-
ESS_STAT	ESS system status	6	2	00H	-
ODOMETER_LEFT	Mileage counter for odometer, Left hand	8	4	00H	0FH
ODOMETER_RIGHT	Mileage counter for odometer, Right hand	12	4	00H	0FH
WHEEL_FL	Wheel velocity, front, left-hand	16	12	000H	FFFH
WHEEL_FR	Wheel velocity, front, right-hand	28	12	000H	FFFH
WHEEL_RL	Wheel velocity, rear, left-hand	40	12	000H	FFFH
WHEEL_RR	Wheel velocity, rear, right-hand	52	12	000H	FFFH

Memory layout:

WHEEL_RR (MSB)							56
WHEEL_RR (LSB)				WHEEL_RL (MSB)			48
WHEEL_RL (LSB)							40
WHEEL_FR (MSB)							32
WHEEL_FR (LSB)				WHEEL_FL (MSB)			24
WHEEL_FL (LSB)							16
ODOMETER_RIGHT				ODOMETER_LEFT			8
ESS_STAT	ABS_DIAG	EBD_W_LAMP	ABS_W_LAMP	ABS_ACT	EBD_DEF	ABS_DEF	0

Transmission parameters - Conditions

System	ABS
Output period	20 ms
Output period tolerance	± 5 ms
Latency	max. 5 ms
Transmit condition	Power supply via EMS primary relay
Remote operation	no
Message Time out	500ms
Message Validity	IGN1
Phase relationship to another message	no

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ABS_DEF	**ABS "defective" indication**	**ABS1**	**0580H**	**0**	**1**

Signal definition:

ABS_DEF:
Information regarding the ABS "defective" indication.

There is no specific phase relationship between the output and any other signal.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H .. 01H

Conversion:

ABS_DEF	Function
0	ABS is not defective
1	ABS is defective

Receiver of signal and signal features required by the receiver:
%%
EMS, TCU, ACU, SPAS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit lnd.
EBD_DEF	**EBD „defective“ indication**	**ABS1**	**0580H**	**1**	**1**

Signal definition:

EBD_DEF:
Information regarding the EBD „defective“ indication.

There is no specific phase relationship between the output and any other signal.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H .. 01H

Conversion:

EBD_DEF	Function
0	EBD is not defective
1	EBD is defective

Receiver of signal and signal features required by the receiver:
%%
TCU, EMS, SPAS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ABS_ACT	**ABS “control“ indication**	**ABS1**	**0580H**	**2**	**1**

Signal definition:
ABS controller provides an information on ABS Active signal.

ABS_ACT signal is 1 during the ABS control and if it is not ABS control phase this value is 0.

Functional requirements for ABS Active Signal:

Initial value : 00H

Physical range : 0 … 1 = 00H .. 01H

Conversion :

ABS_ACT	Function
0	ABS control inactive
1	ABS control active

Receiver of signal and signal features required by the receiver:
%%
TCU, CVT, ACU, SPAS, EPB

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ABS_W_LAMP	**ABS Warning lamp**	**ABS1**	**0580H**	**3**	**1**

Signal definition:

ABS_W_LAMP : The signal indicates the status of the “ABS Warning lamp”

There is no specific phase relationship between the output and any other signal

Functional requirements:

Initial value : 00H

Error identifier : -

Physical range : 0 … 1 = 00H .. 01H

Conversion :

ABS_W_LAMP	Function
0	ABS Warning lamp OFF
1	ABS Warning lamp ON

Receiver of signal and signal features required by the receiver :

CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
EBD_W_LAMP	**EBD Warning lamp**	**ABS1**	**0580H**	**4**	**1**

Signal definition:

EBD_W_LAMP : The signal indicates the status of the “EBD Warning lamp”

There is no specific phase relationship between the output and any other signal

Functional requirements:

Initial value : 00H

Error identifier : -

Physical range : 0 … 1 = 00H .. 01H

Conversion :_

EBD_W_LAMP	Function
0	EBD Warning lamp OFF
1	EBD Warning lamp ON

Receiver of signal and signal features required by the receiver :

CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ABS_DIAG	**ABS “diagnostic mode” indication**	**ABS1**	**0580H**	**5**	**1**

Signal definition:

ABS_DIAG : Information regarding the ABS “diagnostic mode” indication.

There is no specific phase relationship between the output and any other signal

Functional requirements:

Initial value : 00H

Error identifier : -

Physical range : 0 … 1 = 00H .. 01H

Conversion :

ABS_DIAG	Function
0	ABS is not diagnostic mode
1	ABS is diagnostic mode

Receiver of signal and signal features required by the receiver :

CLU

Note:

##

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ESS_STAT	**ESS system status**	**ABS1**	**0580H**	**6**	**2**

Signal definition:

Information on ESS system active/inactive/fail from ABS/ESC.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H .. 03H

Conversion:

ESS_STAT	Function
00H	ESS control “inactive” (Normal condition)
01H	ESS control “active” (Emergency stop condition)
02H	ESS system is defective
03H	Reserved

Receiver of signal and signal features required by the receiver:

CLU, EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ODOMETER_LEFT	**Mileage counter for odometer, Left hand**	**ABS1**	**0580H**	**8**	**4**
ODOMETER_RIGHT	**Mileage counter for odometer, Right hand**	**ABS1**	**0580H**	**12**	**4**

Signal definition:

This signal indicates mileage counter of driven wheels. ABS system calculates driven wheels' mileage of 1m resolution and sends it to a cluster.
If the mileage is greater than 14m then ABS should count again form 0m.
A cluster adds up total mileage using this signal and displays mileage to its odometer.

Functional requirements:

Initial value: 00H

Error identifier: 0FH

Physical range: 0…14m = 00H...0EH

Conversion (PH) = 1 * (HEX) [m]

Receiver of signal and signal features required by the receiver:

CLU

Note:
※ This signal will be not supported for all vehicles [started with AM ('08. 9/15)]

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
WHEEL_FL	**Wheel velocity, front, left-hand**	**ABS1**	**0580H**	**16**	**12**
WHEEL_FR	**Wheel velocity, front, right-hand**	**ABS1**	**0580H**	**28**	**12**
WHEEL_RL	**Wheel velocity, rear, left-hand**	**ABS1**	**0580H**	**40**	**12**
WHEEL_RR	**Wheel velocity, rear, right-hand**	**ABS1**	**0580H**	**52**	**12**

Signal definition:

These signals provides the wheel velocity of each wheel and have 12 bits length and a resolution of 0.125 km/h.
In case of failure of one wheel speed sensor, the value FFFH is used as error identifier.

Functional requirements for wheel velocities**:**

Initial value: 000H

Error identifier: FFFH

Physical range: 0 ... 511.75 km/h = 00H... FFEH

Conversion: (PH) = 0.125 * (HEX) [km/h]

Receiver of signal and signal features required by the receiver:
%%
EMS, TCU, 4WD, CLU, PGS, EPB

Note:

6.2.7 WHL_SPD Message

%%

Message: WHL_SPD	Identifier: 04B0H

Signal label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
WHL_SPD_FL	Wheel speed (high reolution), front, left-hand	0	14	000H	3FFFH
Reserved	Reserved bits	14	2	00H	-
WHL_SPD_FR	Wheel speed (high reolution), front, right-hand	16	14	000H	3FFFH
Reserved	Reserved bits	30	2	00H	-
WHL_SPD_RL	Wheel speed (high reolution), rear, left-hand	32	14	000H	3FFFH
Reserved	Reserved bits	46	2	00H	-
WHL_SPD_RR	Wheel speed (high reolution), rear, right-hand	48	14	000H	3FFFH
Reserved	Reserved bits	62	2	00H	-

Memory layout:

Reserved	WHL_SPD_RR (MSB, 6bits)	56
WHL_SPD_RR (LSB)		48
Reserved	WHL_SPD_RL (MSB, 6bits)	40
WHL_SPD_RL (LSB)		32
Reserved	WHL_SPD_FR (MSB, 6bits)	24
WHL_SPD_FR (LSB)		16
Reserved	WHL_SPD_FL (MSB, 6bits)	8
WHL_SPD_FL (LSB)		0

Transmission parameters - Conditions

System	ESC
Output period	20 ms
Output period tolerance	± 5 ms
Latency	max. 5 ms
Transmit condition	Power supply via EMS primary relay
Remote operation	no
Message Time out	500ms
Message Validity	IGN1
Phase relationship to another message	no

* This message is for the SCC system.and higher reolution of wheel speed signal.

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
WHL_SPD_FL	**Wheel speed(high resolution), front, left-hand**	**WHL_SPD**	**04B0H**	**0**	**14**
WHL_SPD_FR	**Wheel speed(high resolution), front, right-hand**	**WHL_SPD**	**04B0H**	**16**	**14**
WHL_SPD_RL	**Wheel speed(high resolution), rear, left-hand**	**WHL_SPD**	**04B0H**	**32**	**14**
WHL_SPD_RR	**Wheel speed(high resolution), rear, right-hand**	**WHL_SPD**	**04B0H**	**48**	**14**

Signal definition:

These signals provides the wheel velocity of each wheel and have 14 bits length and a resolution of 0.03125 km/h.(This resolution is higher than that of signal in TCS5).
In case of failure of one wheel speed sensor, the value 3FFFH is used as error identifier.

Functional requirements for wheel velocities**:**

Initial value: 0000H

Error identifier: 3FFFH

Physical range: 0 ... 511.9375 km/h = 00H... 3FFEH

Conversion: (PH) = 0.03125 * (HEX) [km/h]

Receiver of signal and signal features required by the receiver:

SCC, AFLS, PGS

Note:

6.2.8 WHL_PUL Message

##

Message: WHL_PUL	Identifier: 04B1H

Signal label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
WHL_PUL_FL	ABS/ESC FL Wheel Pulse Count	0	8	00H	FFH
WHL_PUL_FR	ABS/ESC FR Wheel Pulse Count	8	8	00H	FFH
WHL_PUL_RL	ABS/ESC RL Wheel Pulse Count	16	8	00H	FFH
WHL_PUL_RR	ABS/ESC RR Wheel Pulse Count	24	8	00H	FFH
Free	Free bits	32	24	00H	-
WHL_PUL_Chksum	Signal checksum	56	8	00H	-

Memory layout:

WHL_PUL_Chksum	56
Free	48
Free	40
Free	32
WHL_PUL_RR	24
WHL_PUL_RL	16
WHL_PUL_FR	8
WHL_PUL_FL	0

Transmission parameters - Conditions

System	ABS/ESC
Output period	20 ms
Output period tolerance	± 5 ms
Latency	max. 5 ms
Transmit condition	Power supply via EMS primary relay
Remote operation	no
Message Time out	500ms
Message Validity	IGN1
Phase relationship to another message	no

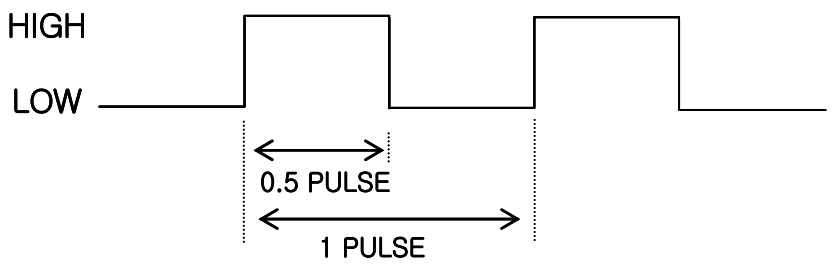
* This message for “SPAS(Smart Parking Assist System)” applied vehicles only.

##

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
WHL_PUL_FL	**FL Wheel Pulse Count**	**WHL_PUL**	**04B1H**	**0**	**8**
WHL_PUL_FR	**FR Wheel Pulse Count**	**WHL_PUL**	**04B1H**	**8**	**8**
WHL_PUL_RL	**RL Wheel Pulse Count**	**WHL_PUL**	**04B1H**	**16**	**8**
WHL_PUL_RR	**RR Wheel Pulse Count**	**WHL_PUL**	**04B1H**	**24**	**8**

Signal definition:

This signal indicates accumulated pulse counter of ABS/ESC wheel speed sensor (FL/FR/RL/RR)
Receiver unit uses this signal for calculation of vehicle movement distance.
Requested resolution of this signal is 0.5 pulses and refer to below (wheel sensor signal).



Functional requirements:

Initial value: 00H

Error identifier: FFH

Physical range: 0…127 pulse count = 00H .. FEH

Conversion: (PH) = 0.5 * (HEX) [pulse count]

Receiver of signal and signal features required by the receiver:

SPAS

Note:

##

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
WHL_PUL_Chksum	**Signal checksum**	**WHL_PUL**	**04B1H**	**56**	**8**

Signal definition:

This signal is used to check the WHL_PUL message is transmitted correctly.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0…255 = 00H .. FFH

Conversion: (PH) = Byte (Byte0+Byte1+Byte2+Byte3+Byte4+Byte5+Byte6)

Receiver of signal and signal features required by the receiver:

SPAS

Note:

6.2.9 EMS1 Message

Message: EMS1	Identifier: 0316H

Signal Label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
SWI_IGK	Terminal 15 - KEY ON	0	1	01H	-
F_N_ENG	Error - engine speed signal	1	1	00H	-
ACK_TCS	Acknowledgement TCS	2	1	00H	00H
PUC_STAT	Engine in fuel cut off	3	1	00H	-
TQ_COR_STAT	Status, torque intervention	4	2	00H	-
RLY_AC	Activation, air conditioner compressor relay	6	1	00H	-
F_SUB_TQI	Error on MAF signal	7	1	00H	-
TQI_ACOR	Indicated engine torque after torque interventions	8	8	00H	-
N	Engine speed	16	16	0000H	-
TQI	Indicated engine torque	32	8	00H	-
TQFR	Frictional torque	40	8	00H	-
VS	Vehicle speed	48	8	00H	FFH
RATIO_TQI_BAS_MAX_STND	Standard torque ratio	56	8	7FH	-

Memory layout:

RATIO_TQI_BAS_MAX_STND							56
VS							48
TQFR							40
TQI							32
N (high)							24
N (low)							16
TQI_ACOR							8
F_SUB_TQI	RLY_AC	TQ_COR_STAT	PUC_STAT	ACK_TCS	F_N_ENG	SWI_IGK	0

Transmission parameters - Conditions

Message	EMS1
System	EMS
Output period	10 ms
Output period tolerance	± 6 ms
Latency	max. 5 ms
Remote operation	no
Message Time out	500ms
Message Validity	IGN1
Phase relationship to another message	no

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
SWI_IGK	**Terminal 15 "ON"**	**EMS1**	**0316H**	**0**	**1**

Signal definition:

Status of ignition lock.

There is no specific phase relationship between the output and any other signal.

Circuit schematic for signal conditioning: none

Functional requirements:

Initial value: 01H

Physical range: 0..1 = 00H .. 01H

Conversion:

SWI_IGK	Function
0	KEY OFF, control unit in self-holding phase
1	KEY ON

Receiver of signal and signal features required by the receiver:
all: status via ignition voltage and consequently function of EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ACK_TCS	**Acknowledgement TCS**	**EMS1**	**0316H**	**2**	**1**

Signal definition:

Monitoring of TCS message; the EMS checks whether at least one new message has been transferred within 500 ms, and whether there is no plausibility error in conjunction with a torque intervention. If this case occurs, the bit is set; otherwise it is reset.

Plausibility check - torque intervention:
- Test criteria:

TCS mode, criteria C1:
(TCS_REQ=1) & (TQI_TCS<FFH) & (MSR_C_REQ = 0) & (TQI_MSR = 00H)
MSR mode, criteria C2:
(TCS_REQ=0) & (TQI_TCS=1's complement of TQI_MSR) & (MSR_C_REQ = 1) & (TQI_MSR > 00H)
No intervention, criteria C3 :
(TCS_REQ=0) & (TQI_TCS=FFH) & (MSR_C_REQ = 0) & (TQI_MSR = 00H)

- Criterion for error setting:

C1 v C2 v C3 ≠ 1 (none of C1,C2 and C3 is true) for n message transmissions TCS1 (n=10)

- Criterion for remedying an error:
Ignition OFF; transmission is re-started if plausibility is OK for at least one CAN transmission.

There is no specific phase relationship between the output and any other signal.

Circuit schematic for signal conditioning: none

Functional requirements:

Initial value: 00H

Error identifier: 00H

Physical range: 0..1 = 00H .. 01H

Conversion:

ACK_TCS	Function
0	TCS message not received within the last 500 ms, or a plausibility error in torque intervention is "ON"
1	TCS message received, and no plausibility error

Receiver of signal and signal features required by the receiver:

TCS, ESC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
PUC_STAT	**Engine in fuel cut off**	**EMS1**	**0316H**	**3**	**1**

Signal definition:
If the PUC_STAT - bit = 1 then the engine is in fuel cut off state, i.e. e. no injection is applied.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0..1 = 00H .. 01H

Conversion:

PUC_STAT	Function
0	Engine not in fuel cut off
1	Engine in fuel cut off

Receiver of signal and signal features required by the receiver:
%%
TCU, FATC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
TQ_COR_STAT	**Status Torque Intervention**	**EMS1**	**0316H**	**4**	**2**

Signal definition:

The information TQ_COR_STAT informs the TCS or the TCU whether and to which extent injection and ignition interventions are admitted.

There is no specific phase relationship between the output and any other signal.

Representation of numerical value:

		TQ_COR_STAT					
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Circuit schematic for signal conditioning: none

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: -

Conversion:

Status	Bit 5	Bit 4	Meaning
0	0	0	The desired intervention regarding ignition angle retardation and cylinder shut-off is executed. (Default value)
1	0	1	The desired intervention regarding ignition angle retardation and cylinder shut-off is executed; however, the requested target torque can not be adjusted precisely (torque steps)
2	1	0	The torque reduction regarding the ignition angle retardation cannot be completely executed. A cylinder shut-off is not possible at this time. Therefore a remaining torque (as difference between TQI_ASR/GS_REQ and TQI_INTV) is present and cannot be reduced.
3	1	1	Due to a failure detected by a diagnosis function of the engine management system, the desired torque intervention for TCS regarding the ignition angle and cylinder shut-off is no longer executed. The torque intervention is terminated, the engine management system resets the requested engine torque to the TQI value using a ramp.

Receiver of signal and signal features required by the receiver:

TCU, ESC, TCS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
RLY_AC	**Activation of air conditioner compressor relay**	**EMS1**	**0316H**	**6**	**1**

Signal definition:

The signal RLY_AC identifies the activation of the air conditioner compressor relay.

There is no specific phase relationship between the output and any other signal.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0..1 = 00H .. 01H

Conversion:

RLY_AC	Function
0	Air conditioner compressor relay OFF
1	Air conditioner compressor relay ON

Receiver of signal and signal features required by the receiver:

TCS: Load sensing
TCU: Load sensing
FATC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
TQI	**Indicated engine torque**	**EMS1**	**0316H**	**32**	**8**
F_SUB_TQI	**Error on load signal**	**EMS1**	**0316H**	**7**	**1**

Signal definition:

1) In cars equipped with gasoline engines with ETC system, the signal TQI is determined on the driver's demand including cruise control and other functions and corresponds to the theoretical engine torque. The signal comprises influences, such as the ambient temperature, the atmospheric pressure, knock control, the catalyst overheating prevention function and other corrections but it does not depend on TCS/ESC and TCU interventions realised due to reduction of airflow into the engine cylinders and due to ignition angle adjustment or injection/cylinder shut off.

TQI = f (drivers demand [with the influence of cruise control and other functions without the influence of TCS/ESC and TCU interventions], ignition angle [without the influence of TCS/ESC and TCU interventions])

2) In cars equipped with gasoline engines without ETC system, the signal TQI is determined on the basis of the measured air mass flow (MAF) which corresponds to the theoretical engine torque as demanded by the driver. The signal comprises influences, such as the ambient temperature, atmospheric pressure, knock control, the catalyst overheating prevention function and other corrections but it does not depend on TCS/ESC and TCU interventions realised due to ignition angle adjustment or injection/cylinder shut off.

TQI = f (MAF, ignition angle [without the influence of TCS/ESC and TCU interventions])

3) In cars equipped with Diesel engines, the signal TQI is determined on the basis of the driver's demanding injected Diesel amount including cruise control and other functions but does not including the influence of TCS/ESC and TCU interventions. It corresponds to the theoretical engine torque and comprises influences such as the ambient temperature, the atmospheric pressure and other corrections.

TQI = f (injected Diesel amount [without TCS/ESC and TCU interventions])

In case of failures of the load signal (either MAF error or other errors depending on the system configuration), a backup value is generated from specific index tables. The backup value mode is identified by the signal F_SUB_TQI.

There is a specific phase relationship between the signals TQI and F_SUB_TQI.

The specified torque TQI_x refers to a maximum torque TQ_STND. This conversion into a physical quantity results in a range of 0...99.6094% for TQ_STND.

E.g. : If TQI_x = FF H, then TQI_x (PH) = (0.390625 * FFH) %= 99.6094% of TQ_STND

Functional requirements:

Initial value: 00H

Error identifier: by F_SUB_TQI
00H : no error
01H : Error on Torque Measurement

Physical range: 0..99.6094 % (of TQ_STND) = 00H .. FFH

Conversion: (PH) = 0.390625 * (HEX) [%]

Receiver of signal and signal features required by the receiver:

TCS: Update: < 50 ms
ESC: Update: 20ms
TCU: Signal is used for shift pressure calculation

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
TQI_ACOR	**Indicated torque after torque interventions**	**EMS1**	**0316H**	**8**	**8**

Signal definition:

The signal TQI_ACOR comprises the actual indicated engine torque (determined by calculation within the engine management system) (lambda control, knock control, catalyst overheating prevention function, temperature influences, TCS, TCU torque intervention etc. being taken into account).

The specified torque TQI_x refers to a maximum torque TQ_STND. This conversion into a physical quantity results in a range of 0...99.6094% for TQ_STND.

Circuit schematic for signal conditioning: none

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0..99.6094 % (of TQ_STND) = 00H .. 0FFH

Conversion: (PH) = 0.390625 * (HEX) [%]

E.g. : If TQI_ACOR = FF H, then TQI_ACOR (PH) = (0.390625 * FFH) %= 99.6094% of TQ_STND

Receiver of signal and signal features required by the receiver:
%%
TCU: TCU requires this signal for checking the torque intervention.
Updating: 10 ms.
ESC: Update: 20ms
TCS: TCS requires this signal for checking the torque intervention.
Updating: < 50 ms.
EPB

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
N	**Engine speed**	**EMS1**	**0316H**	**16**	**16**
F_N_ENG	**Error N signal**	**EMS1**	**0316H**	**1**	**1**

Signal definition:

The signal N is generated by crankshaft segment period measurement (in case of an six-cylinder engine, this corresponds to a crankshaft angle of 120°) and measured with a resolution of 4 μs.
The signal N is represented as a 16 bit value.

The signal is not filtered; however, the maximum filter time must not exceed the limits of the output period.

Representation of the numerical value:
16 bit engine speed information; low-order number on low-order address (L/H).

The signal F_N_ENG identifies an error on searching for a long tooth or on engine speed sensing.
Note : in some cases a limp-home function can be activated in the ECU (the engine speed signal is then based on the camshaft signal), and the engine may run even if an error is present on the crankshaft signal.

There is a specific phase relationship between the signals N and F_N_ENG.

Functional requirements:

Initial value: 0000H

Error identifier: by F_N_ENG
00H: no error
01H: engine speed sensor defective

Physical range: 0..16383.75 rpm = 0000H .. FFFFH

Conversion: (PH) = 0.25 * (HEX) [rpm.]

Receiver of signal and signal features required by the receiver:
%%
TCS/ESC: Internal calculation
TCU: Internal calculation
SCC, FATC, ACU, AFLS, MDPS, EPB

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
TQFR	**Frictional torque**	**EMS1**	**0316H**	**40**	**8**

Signal definition:

The signal TQFR identifies the current engine friction loss torque. It is stored as a function of TEMP_ENG and N (TQFR = f(TEMP_ENG, N)) in terms of an index table.
The index table is corrected depending on the current load under idle conditions.

The signal TQFR comprises the following influencing variables:
- Engine friction = f(TEMP_ENG, n, m)
- m= friction coefficient = f(oil,...)
- Charge cycle work
- Valve actuator
- Air conditioner compressor - interference compensation (intermittent)
- Accessories (e.g. water pump, generator, power-steering pump).

The engine friction losses are dominant in conjunction with the following influencing variables.

Peak loads are not included in the calculation.

Consequently, the engine output torque (flywheel torque) is calculated as follows:

TQ = TQI_ACOR – TQFR

The specified torque TQI_x refers to a maximum torque TQ_STND. If this value is converted into a physical quantity, the resulting range of values for TQ_STND is 0..99.6094%.

There is no specific phase relationship between the output and any other signal.

Functional requirements:

Initial value: 00H

Physical range: 0..99.6094% = 000H .. 0FFH

Conversion: (PH) = 0.390625 * (HEX) [%]

Receiver of signal and signal features required by the receiver:
%%
TCS: Updating < 50 ms
ESC: Update: 20ms
TCU, EPB

Note:
Transmission of frictional torque:
By transmission of TQI and TQFR, each ECU connected is able to calculate the current useful torque on its own. In the case of the TCS torque intervention, this type of transmission permits a reduction to absolute zero, i.e. utilization of the engine braking torque.
As wheel slip tends to cause the engine drag control to adjust to the frictional torque, TQFR can also be used in terms of pre-control value.

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
VS	**Vehicle speed**	**EMS1**	**0316H**	**48**	**8**

Signal definition:

The velocity of the vehicle is transferred. The signal VS is necessary to have a vehicle speed information even is there is no TCS ECU (compare to signal WHEEL of message TCS1)

In case of failure the value FFH is used as error identifier.

There is no specific phase relationship between the output and any other signal.

Circuit schematic for signal conditioning: none

Functional requirements for wheel velocities:

Initial value: 00H

Error identifier: FFH

Physical range: 0 ... 254 km/h = 00H.. FEH

Conversion: (PH) = 1 * (HEX) [km/h]

Receiver of signal and signal features required by the receiver:
%%
TCU, SCC, FATC, ACU, MDPS, SPAS, EPB

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
RATIO_TQI_BAS_ MAX_STND	**torque reduction factor**	**EMS1**	**0316H**	**56**	**8**

Signal definition:

This factor is calculated inside the ECU to express the long-term changes of the engine torque capabilities due to special operating conditions. It takes into consideration mainly the ambient pressure, the ambient air temperature, and the fuel quality. It is defined as follows :

Torque reduction factor = Possible indicated torque for current conditions / Possible indicated torque at standard conditions

It is used by the TCU to adapt the gearshift strategy.

Initial value: 7FH

Error identifier: -

Physical range: 0 ... 2 = 00.. FFH

Conversion: (PH) = 0.0078 * (HEX)

Receiver of signal and signal features required by the receiver:
TCU

Note:

6.2.10EMS2 Message

Message: EMS2	Identifier: 0329H

Signal Label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
MUL_INFO	Multiplexed information	0	6	CAN_VERS	-
MUL_CODE	Identification of information	6	2	00H	-
TEMP_ENG	Engine coolant temperature	8	8	FFH	FFH
MAF_FAC_ALTI_MMV	Mass air flow correction factor for altitude	16	8	80H	80H
VB_OFF_ACT	ECU adaptive values and failure memory erase after battery disconnection	24	1	00H	-
ACK_ES	Acknowledgement, engine stopped	25	1	00H	-
CONF_MIL_FMY	Configuration of MIL Handling and Failure Memory Management by ECU	26	3	03H	-
OD_OFF_REQ	Over drive off request to TCU	29	1	00H	-
ACC_ACT	Auto cruise control in activation	30	1	00H	-
CLU_ACK	Clutch operation acknowledge	31	1	00H	
BRAKE_ACT	Indication of brake switch ON/OFF	32	2	01H	03H
ENG_CHR	Engine Characteristic – Kind of fuel, ETS	34	4	00H	-
GP_CTL	Glow plug control request	38	2	00H	02H
TPS	Throttle Position Signal	40	8	20H	FFH
PV_AV_CAN	Accelerator pedal value	48	8	00H	FFH
ENG_VOL	Engine Displacement	56	8	-	-

Memory layout:

ENG_VOL						56
PV_AV_CAN						48
TPS						40
GP_CTL		ENG_CHR		BRAKE_ACT		32
CLU_ACK	ACC_ACT	OD_OFF_REQ	CONF_MIL_FMY	ACK_ES	VB_OFF_ACT	24
MAF_FAC_ALTI_MMV						16
TEMP_ENG						8
MUL_CODE		MUL_INFO				0

Transmission parameters - Conditions

Message	EMS2
System	EMS
Output period	10 ms
Output period tolerance	± 6 ms
Latency	max. 5 ms
Remote operation	no
Message Time out	500ms
Message Validity	IGN1
Phase relationship to another message	no

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
MUL_INFO	**Multiplexed information**	**EMS2**	**0329H**	**0**	**6**
MUL_CODE	**Identification of information**	**EMS2**	**0329H**	**6**	**2**

Signal definition:

In MUL_INFO the EMS transmits up to four multiplexed messages. The information is selected via MUL_CODE.

In general, the transmission of MUL_INFO and MUL_CODE starts with CAN_VERS.

The information is switched at intervals of 50..100 ms. Cyclic switching of information is limited to the ON status of SWI_IGK.

There is no specific phase relationship between the output and any other signal.

Circuit schematic for signal conditioning: none

Functional requirements:

Initial value: refer to appropriate signals

Error identifier: refer to appropriate signals

Conversion:

MUL_CODE	FUNCTION
00B	CAN_VERS
01B	CONF_TCU
10B	OBD_FRF_ACK
11B	TQ_STND

Receiver of signal and signal features required by the receiver:
%%
TCS/ESC: TQ_STND for torque interface
TCS/ESC: CONF_TCU for A/T or M/T detection
ACU, EPB

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CAN_VERS	**CAN version**	**EMS2**	**0329H**	**0**	**6**

Signal definition:

This signal indicates Version of this CAN specification (HMC/KIA Engineering Standard) used for communication.
The purpose of this signal is to check the version of this CAN communication specification of a vehicle or to let other systems refer to implemented version of this CAN specification of an EMS system which is connected together.

Representation of the numerical value:

MUL_CODE		MUL_INFO					
0	0	CAN_VERS					
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 5 ~ Bit3 represent decimal (0~7) and Bit 2 ~ Bit 0 represent decimal place(digits under decimal point, i.e. 0.0~0.7) e.g. If the CAN version is 1.5 then Bit5 through Bit3 are 001b and Bit2 through Bit0 are 101b.

Functional requirements:

Initial value: Corresponding CAN version

Error identifier: -

Physical range: 0.0 … 7.7 = 00H … 3FH

Conversion:

CAN_VERS	Function
Bit 5 – Bit 3	Decimal value of the version number (0~7)
Bit 2 – Bit 0	Under decimal point value of the version number (0.0~0.7)

Receiver of signal and signal features required by the receiver:

ESC/TCS/ABS, TCU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CONF_TCU	**A/T - M/T information**	**EMS2**	**0329H**	**0**	**6**

Signal definition:

A/T or M/T information generated by automatic variant coding.
A/T information is got from the “TCU_TYPE” signal of TCU1 message. (See TCU1 message information)

Representation of the numerical value:

MUL_CODE		MUL_INFO					
0	1	CONF_TCU					
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Circuit schematic for signal conditioning: none

Functional requirements:

Initial value: Appropriate Value

Error identifier: -

Physical range: -

Conversion:

CONF_TCU	Function
00H	A/T vehicle (Step Shift A/T)
0AH	CVT vehicle (CVT A/T)
0BH	DCT vehicle (DCT A/T)
0FH	M/T vehicle

Receiver of signal and signal features required by the receiver:

TCS, ABS, ESC, ACU

Note:

※ For the automatic variant coding at E.O.L : This signal value is valid 1.5sec later from initial IG-ON

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
OBD_FRF_ACK	**OBD freeze frame acknowledgement**	**EMS2**	**0329H**	**0**	**6**

Signal definition:

An ECU which detects an OBD fault, requires the EMS to store a set of environmental conditions (freeze frame). If the EMS follows this requirement it is acknowledged in OBD_FRF_ACK. Also the synchronization of OBD relevant ECUs is made by this signal:

Bit 3-5 is used for freeze frame acknowledgement.
Bit 2 is set, in case a driving cycle has started.
Bit 1 is set, in case a trip is finished.
Bit 0 is set, in case a warm up cycle is finished.

There is no specific phase relationship between the output and any other signal.

Representation of the numerical value:

MUL_CODE		MUL_INFO					
1	0	OBD_FRF_ACK					
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Circuit schematic for signal conditioning: none

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: -

Conversion:

Bit 5, 4, 3 freeze frame status	Bit 2 driving cycle	Bit 1 trip	Bit 0 warm up cycle	Function
0				no freeze frame stored
1				freeze frame requested by EMS
2				freeze frame requested by TCU
3				freeze frame requested by TCS
4				Reserved
5				Reserved
6				Reserved
7				Reserved

Receiver of signal and signal features required by the receiver:

TCS, TCU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
TQ_STND	**Scaling factor for torque interface**	**EMS2**	**0329H**	**0**	**6**

Signal definition:

The value TQ_STND specifies the torque to which the other torque quantities are referred. The conversion into a physical quantity provides a displayable range of 0...99.6094% of TQ_STND for the appropriate signals.

If MUL_CODE = 11B is transmitted, the signal MUL_INFO contains the information TQ_STND (to this effect, see also MUL_INFO and MUL_CODE).

There is a specific phase relationship to the signal MUL_CODE.

Representation of the numerical value:

MUL_CODE		MUL_INFO					
1	1	TQ_STND					
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Circuit schematic for signal conditioning: none

Functional requirements:

Initial value: Appropriate value

Error identifier: -

Physical range: 0 .. 630 Nm = 00H .. 3FH ---- ① or
0 .. 945 Nm = 00H .. 3FH ---- ②

Conversion: (PH) = 10 * (HEX) [Nm] ---- ① or
(PH) = 15 * (HEX) [Nm] ---- ②

Receiver of signal and signal features required by the receiver:

TCS, TCU, ESC

@@
Note:
~~Conversion rule ② is only for diesel engine which maximum engine torque is higher than 520 Nm. (e.g. S3.0 engine installed in HM vehicle)~~
Conversion rule ② is applied for an engine which maximum engine torque is higher than 520 Nm.
- S3.0 diesel engine installed in HM vehicle
- Tau 5.0/5.5 engine in BH/VI vehicle

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
TEMP_ENG	**Engine coolant temperature**	**EMS2**	**0329H**	**8**	**8**

Signal definition:

Engine coolant temperature in EMS sensed via an A/D converter; converted into degrees centigrade (°C).

There is no specific phase relationship between the output and any other signal.

Circuit schematic for signal conditioning: none

Functional requirements:

Initial value: FFH

Error identifier: FFH

Physical range: -48 .. 142.5 °C = 00H .. FEH

Conversion: (PH) = 0.75 * (HEX) - 48 [°C]

Receiver of signal and signal features required by the receiver:
TCU: Operating point contro
CLU, FATC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
MAF_FAC_ALTI_MMV	**Mass air flow correction factor for altitude**	**EMS2**	**0329H**	**16**	**8**

Signal definition:

The altitude correction factor MAF_FAC_ALTI_MMV is calculated from division of MAF by MAF_SUB_DIAG (=limp home-value for MAF) or from AMP_AD by 1013 mbar in order to take into account different atmospheric pressures at different altitudes.

The Initial-value of 1.0 indicates sea-level, whereas lower values indicate altitude. MAF_FAC_ALTI_MMV is limited to C_MAF_FAC_ALTI_MMV_MIN (=0.6) and C_MAF_FAC_ALTI_MMV_MAX (=1.1) by calibration.

Circuit schematic for signal conditioning: none

Functional requirements:

Initial value: 80H

Error identifier: 80H (Default value under an error condition)

Physical range: 0 ... 1.992 = 00H .. FFH

Conversion: (PH) = 0.00781 *(HEX) [-]

Receiver of signal and signal features required by the receiver:

TCU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
VB_OFF_ACT	**FMY reset after battery disconnected**	**EMS2**	**0329H**	**24**	**1**

Signal definition:

The signal specifies that ECU has detected a disconnection of the battery since last driving cycle, and therefore has reset the adaptive values and failure memory.
If the EMS does not support this signal the value is 00H

Functional requirements:

Initial value: 00H

Error identifier: -

Range: 00..01H

Conversion:

VB_OFF_ACT	Function
0	no battery disconnection detected
1	battery disconnection detected and failure memory erased

Receiver of signal and signal features required by the receiver:

TCU

Note:

The failure memory erasure is activated only if the calibration C_CONF_NVMY_RST is set to 1 inside the EMS.

This signal is only for the gasoline system.

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ACK_ES	**Acknowledgement "engine stopped"**	**EMS2**	**0329H**	**25**	**1**

Signal definition:

The signal specifies the acknowledgement of the request for the operating state "engine stopped".

Functional requirements:

Initial value: 00H

Error identifier: -

Range: 00..01H

Conversion:

ACK_ES	Function
0	No acknowledgement
1	Acknowledgement "engine stopped"

Receiver of signal and signal features required by the receiver:
Control unit operating state "engine stopped".
ACU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CONF_MIL_FMY	**Configuration of MIL Handling and Failure Memory Management by ECU**	**EMS2**	**0329H**	**26**	**3**

Signal definition:

The signal specifies the Configuration of the MIL Handling and Failure Memory Management by ECU.

Functional requirements:

Initial value: 03H

Error identifier: -

Range: 00..05H

Conversion:

CONF_MIL_FMY	Function
0H (000b)	no MIL, Failure Memory Management OBD-I
1H (001b)	MIL Treatment OBD-I, Failure Memory Management OBD-I
2H (010b)	MIL Treatment OBD-II, Failure Memory Management OBD-II Exception: MIL is illuminated in first driving cycle for comprehensive component monitors (CARB_COMP_OBD)
3H (011b)	MIL Treatment OBD-II, Failure Memory Management OBD-II
4H (100b)	MIL Treatment E-OBD, Failure Memory Management E-OBD
5H (101b)	MIL Treatment KOBD, Failure Memory Management KOBD

Receiver of signal and signal features required by the receiver:

TCU, TCS

Note:

This value represents a calibrated constant from the ECU.

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
OD_OFF_REQ	**Over drive off request to TCU**	**EMS2**	**0329H**	**29**	**1**

Signal definition:

This signal indicates that auto cruise control function requests over drive off of TCU.
In general, the over drive off request is done by hardware. (i.e. line-to-line signal between an EMS and a TCU). However, some systems may not have external over drive off requetst signal line and for these systems OD_OFF_REQ signal can be used as the same function.

Functional requirements:

Initial value: 00H

Error identifier: -

Range: 00..01H

Conversion:

OD_OFF_REQ	Function
0	Normal operation
1	Over drive off request to TCU by the cruise control function

Receiver of signal and signal features required by the receiver:

TCU

Note:
This signal is available in the auto cruise control system equiped vehicles only

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ACC_ACT	**Auto cruise control in activation**	**EMS2**	**0329H**	**30**	**1**

Signal definition:

EMS sends the state of the cruise control via the signal ACC_ACT.
If the EMS does not support this signal the value is 00H

If the cruise control is activated then ACC_ACT = 1. In this period, vehicle speed control (cruise control) is performed by the auto-cruise control function of ECU only (including acceleration control, deceleration control, etc.).

Although “SCC set” switch is on (Cruise control is enabled), if the cruise control function is deactivated (e.g. when a driver presses an accel. pedal or a brake pedal to increase or to decarese vcehicle speed more or less than set speed) then ACC_ACT should be set to ‘0’.

Functional requirements:

Initial value: 00H

Error identifier: -

Range: 00..01H

Conversion:

ACC_ACT	Function
0	Auto cruise control is not active
1	Auto cruise control is active (Vehicle speed control is performed by EMS automatically)

Receiver of signal and signal features required by the receiver:

TCU, TCS/ESC/ABS

Note:

There is signal relationship between ‘ACC_ACT’ and ‘PV_AV_CAN’. See ‘PV_AV_CAN’ signal description page.

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CLU_ACK	**Clutch operation acknowledge**	**EMS2**	**0329H**	**31**	**1**

Signal definition:

This signal indicates that ECU has detected an operation of a clutch. Using this signal an ISG (Idle Stop & Go) system acts as an alternator or a starter.

If the EMS does not support this signal the value is 00H

Functional requirements:

Initial value: 00H

Error identifier: -

Range: 00..01H

Conversion:

CLU_ACK	Function
0	Clutch is not operating
1	Clutch is operating

Receiver of signal and signal features required by the receiver:
%%
ISG(Idle Stop and Go) system, EPB

Note:

This signal is for the diesel engine and ISG system installed vehicles only.

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
BRAKE_ACT	**Indication of brake switch ON/OFF**	**EMS2**	**0329H**	**32**	**2**

Signal definition:

This signal indicates that a brake switch is activated or not. When the brake switch is activated(pressed) its value is 02H otherwise its value is 01H.
If the EMS does not support this signal the value is 00H.

Functional requirements:

Initial value: 01H

Error identifier: 03H

Range: 00..03H

Conversion:

BRAKE_ACT	Function
0H (00b)	EMS does not support this function.
1H (01b)	Brake switch is not pressed (OFF)
2H (10b)	Brake switch is pressed (ON),
3H (11b)	Brake switch failure.

Receiver of signal and signal features required by the receiver:
%%
TCU, TCS/ESC/ABS, ACU, AFLS, EPB, FATC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ENG_CHR	**Engine Characteristic – Kind of fuel, ETC**	**EMS2**	**0329H**	**34**	**4**

Signal definition:

This signal indicates the characteristic of an engine system – which kind of fuel is used, whether the ETC (Electronic Throttle Contro) is applied or not.

When a normal engine system (gasoline fuel and no ETC) is used this value is 00H.

Functional requirements:

Initial value: Appropriate Value

Error identifier: -

Range: 00..02H, 04H…06H

Conversion:

ENG_CHR				Function
Reserv.	ETC	FUEL		
0	0	0	0	Fuel – Gasoline, ETC – No
0	0	0	1	Fuel – LPI(LPG), ETC – No
0	0	1	0	Fuel – Diesel, ETC – No
0	1	0	0	Fuel – Gasoline, ETC – Applied
0	1	0	1	Fuel – LPI(LPG), ETC – Applied
0	1	1	0	Fuel – Diesel, ETC – Applied
X	X	1	1	Reserved - Not Used
1	X	X	X	Reserved - Not Used

Receiver of signal and signal features required by the receiver:

TCU, TCS/ESC/ABS, SCC, ACU

Note:

※ For the automatic variant coding at E.O.L : This signal value is valid 1.5sec later from initial IG-ON.

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
GP_CTL	**Glow plug control request**	**EMS2**	**0329H**	**38**	**2**

Signal definition:

This signal indicates that a diesel ECU requests ISS system to control glow plugs.

If the EMS does not support this signal the value is 00H

Functional requirements:

Initial value: 00H

Error identifier: 02H

Range: 00..03H

Conversion:

GP_CTL	Function
0H (00b)	Glow plug off request
1H (01b)	Glow plug on request
2H (10b)	System Error
3H (11b)	Reserved

Receiver of signal and signal features required by the receiver:

ISS System

Note:

This signal is for the diesel engine system only.

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
TPS	**Throttle Position Signal**	**EMS2**	**0329H**	**40**	**8**

Signal definition:

The signal TPS is a measure of the throttle position.
The throttle position is determined via a potentiometer, which is connected mechanically to the throttle shaft. The voltage value, which is adjusted in the port via the voltage divider, is sensed in the EMS by an A/D converter. The lower mechanical stop (idle) is sensed by a learning algorithm (offset). If the EMS-ECU recognizes closed throttle then the value 20 H is carried over on the CAN. If the EMS-ECU detects full load, that means nearly perpendicular throttle position, then F5 H is carried over on the CAN bus. Even if the throttle position exceeds the full load detection throttle angle the transmitted HEX-value is limited to F5 H.

If an error is detected in sensing of the position, this is identified by the value 0FFH.

Circuit schematic for signal conditioning: none

Functional requirements:

Initial value: 20H

Error identifier: FFH

Physical range: 0...100% = 20H..F5H

Conversion: TPS (PHYS) = (((HEX) - 20 H) * 100/213)[%]

Value	Function
20H	Idle (port value is learnt)
F5H	Throttle perpendicular
FFH	Throttle defective

Receiver of signal and signal features required by the receiver:
%%
TCU, ESC, FATC, ACU, EPB

Note:

In diesel engine system, there is a signal relationship between TPS and PV_AV_CAN. For the details, please see PV_AV_CAN signal description page.

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
PV_AV_CAN	**Accelerator Pedal value**	**EMS2**	**0329H**	**48**	**8**

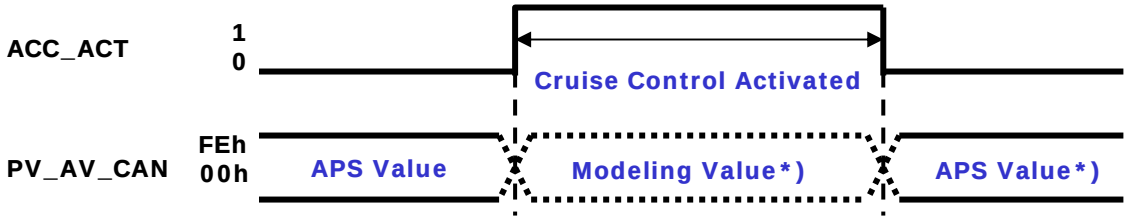
Signal definition:

The signal PV_AV_CAN is a measure of the Accelerator Pedal value.
The accelerator pedal value is determined via 2 pedal sensors, which are connected mechanically to the accelerator pedal. If the EMS-ECU recognizes that the accelerator pedal is not activated, then the value 00 H is carried over on the CAN. If the EMS-ECU detects that the accelerator pedal is fully activated, then FE H is carried over on the CAN bus.

If an error is detected on both pedal sensor channels, this is identified by the value 0FFH.

Signal relationship between ACC_ACT and PV_AV_CAN :

The phase relationship between auto cruise control and PV_AV_CAN is as following figure. If an auto cruise control system is not installed or if cruise control is not activated in auto cruise control system installed vehicle then PV_AV_CAN has actual pedal position value. But if the auto cruise control is activated (actually speed control is performed by EMS), PV_AV_CAN should have modeling value even if a driver does not press the acceleration pedal.



APS Value*) : Acceleration Pedal Sensor value.

Modeling Value*) : Estimated APS value which is calculated by ECU logic considering engine control during the auto-cruise control is activated period. (e.g. estimated throttle value of gasoline engine system or TPS model value of diesel engine system)
And also this value can be used as a driver intension for the shift control of an A/T during auto-cruise control.

Signal relationship between PV_AV_CAN and TPS in DIESEL system :
In a diesel engine vehicle which has an ETC system, basically TPS has APS value. And if auto cruise control is activated then both TPS and PV_AV_CAN should have modeling value which is estimated according to the actual fuel injection and other factors that affect engine torque.

Functional requirements:

Initial value: 00H

Error identifier: FFH

Physical range: 0...99.2% = 00H..FEH

Conversion: PV_AV_CAN (PHYS) = (HEX) * 0.3906[%]

Value	Function
00H	Accelerator Pedal not activated.
FEH	Accelerator Pedal fully activated
FFH	Accelerator Pedal is defective (fail state) or Non-ETC system (APS is not installed)

Receiver of signal and signal features required by the receiver:
%%
TCU, ESC, AFLS, FATC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ENG_VOL	**Engine Displacement**	**EMS2**	**0329H**	**56**	**8**

Signal definition:

This signal indicates the engine displacement (volume).

Representation of the numerical value:

Engine Displacement							
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0

Functional requirement:

Initial value: - (depends on engine displacement)

Error identifier: -

Physical range: 0…25.5 liter = 00H…FFH

Conversion: (PH) = 0.1*(HEX) [liter]

Receiver of signal and signal features required by the receiver:

ABS, ESC, SCC, ACU

Note:

6.2.11EMS3 Message

Message: EMS3	Identifier: 0280H

Signal label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
LV_FUEL_TYPE_ECU	Active fuel type in gasoline ECU	0	1	00H	-
LV_BFS_CFIRM	Bi-Fuel switch confirmation	1	1	00H	-
LV_CRASH	Bit for Crash detection	2	1	00H	-
LV_VB_OFF_ACT	Baterry off detection	3	1	00H	-
LV_GSL_MAP	Indication of AMP or MAP	4	1	00H	-
LV_ENG_TURN	Information Bit for First Engine Turning detected	5	1	00H	01H
Reserved	Reserved for digital flags	6	2	00H	-
ERR_FUEL	Errors in the gasoline ECU	8	8	00H	-
EOS	Engine operating status	16	8	00H	-
TCO	Coolant temperature	24	8	00H	FFH
N_32	Engine speed (32RPM resolution)	32	8	00H	-
MAF	Mass air flow	40	8	00H	-
TIA	Induction air temperature	48	8	00H	FFH
AMP/MAP	Ambient pressure / Manifold Apsolute Pressure	56	8	00H	-/FFH

Memory layout:

AMP / MAP							56
TIA							48
MAF							40
N_32							32
TCO							24
EOS							16
ERR_FUEL							8
RESERVED	LV_ENG_TURN	LV_GSL_MAP	LV_VB_OFF_ACT	LV_CRASH	LV_BFS_CFIRM	LV_FUEL_TYPE_ECU	0

Transmission parameters - Conditions

Message	EMS3
System	EMS
Output period	10 ms
Output period tolerance	± 6 ms
Latency	max. 5 ms
Remote operation	no
Message Time out	500ms
Message Validity	IGN1
Phase relationship to another message	no

NOTE: This message is for an LPI system only

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
LV_FUEL_TYPE_ ECU	**Active Fuel type in gasoline ECU**	**EMS3**	**0280H**	**0**	**1**

Signal definition:

LV_FUEL_TYPE_ECU indicates the active fuel in gasoline ECU. This flag is used for fuel swtiching (bi – fuel).

Circuit schematic for signal conditioning: none

Functional requirements:

Initial value: 0

Error identifier: -

Conversion:

LV_FUEL_TYPE_ECU	FUNCTION
0	Gasoline
1	Gas

Receiver of signal and signal features required by the receiver:
LPI interface box

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
LV_BFS_CFIRM	**Bi Fuel switching confirmation**	**EMS3**	**0280H**	**1**	**1**

Signal definition:

LV_BFS_CFIRM indicates confirmation of fuel switching in gasoline ECU. This flag is used for fuel swtiching (bi – fuel).

Circuit schematic for signal conditioning: none

Functional requirements:

Initial value: 0

Error identifier: -

Conversion:

LV_BFS_CFIRM	FUNCTION
0	Not Confirmed
1	Confirmed

Receiver of signal and signal features required by the receiver:
LPI interface box

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
LV_CRASH	**Bit for crash detection**	**EMS3**	**0280H**	**2**	**1**

Signal definition:

LV_CRASH indicates emergency situation in gasoline ECU.

Circuit schematic for signal conditioning: none

Functional requirements:

Initial value: 0

Error identifier: -

Conversion:

LV_CRASH	FUNCTION
0	Deactivation
1	Activation

Receiver of signal and signal features required by the receiver:
LPI interface box

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
LV_VB_OFF_ACT	**Battery off detection**	**EMS3**	**0280H**	**3**	**1**

Signal definition:

LV_VB_OFF_ACT indicates battery off detection in gasoline ECU. This flag is used to erasing failure menory and adapation values in LPI interface box.

Circuit schematic for signal conditioning: none

Functional requirements:

Initial value: 0

Error identifier: -

Conversion:

LV_VB_OFF_ACT	FUNCTION
0	Deactivation
1	Activation

Receiver of signal and signal features required by the receiver:
LPI interface box

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
LV_ENG_TURN	**Information Bit for First Engine Turning detected**	**EMS3**	**0280H**	**5**	**1**

Signal definition:

If EMS detected three crank tooth signal during Cranking, LV_ENG_TURN = 0 -> 1.

Functional requirements:

Initial value: 00H

Error identifier: 01H

Conversion:

LV_ENG_TURN	FUNCTION
0	Deactivation
1	Activation

Receiver of signal and signal features required by the receiver:
LPI interface box

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ERR_FUEL	**Errors in the gasoline ECU**	**EMS3**	**0280H**	**8**	**8**

Signal definition:

ERR_FUEL indicates errors in gasoline ECU.

There is no specific phase relationship between the output and any other signal.

Representation of the numerical value:

ERR_FUEL							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
OK with restrictions (LV_State _REST)	OK ready to operate (LV_STAT E_OK)	Fuel tank almost empty	Error auxiliary devices	Error fuel system	-	Error gasoline injection path	Error emergency stop

Circuit schematic for signal conditioning: none

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: -

Receiver of signal and signal features required by the receiver:

LPI interface box

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
EOS	**Engine operating states**	**EMS3**	**0280H**	**16**	**8**

Signal definition:

EOS indicates the engine operating states in gasoline ECU.

There is no specific phase relationship between the output and any other signal.

Representation of the numerical value:

EOS							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
All Injector Active (LV_ALLINJACT)	full load (LV_FL)	trailing throttle fuel cut off (LV_PUC)	trailing throttle (LV_PU)	part load (LV_PL)	idle speed (LV_IS)	engine start (LV_ST)	engine stop (LV_ES)

Circuit schematic for signal conditioning: none

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: -

Receiver of signal and signal features required by the receiver:

LPI interface box

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
TCO	**Coolant temperature**	**EMS3**	**0280H**	**24**	**8**

Signal definition:

TCO indicates coolant temperature in gasoline ECU.

There is no specific phase relationship between the output and any other signal.

Circuit schematic for signal conditioning: none

Functional requirements:

Initial value: 00H

Error identifier: FFH

Physical range: -48..+142.5°C = 00H .. FEH

Conversion: (PH) = 0.75 * (HEX) - 48 [°C]

Receiver of signal and signal features required by the receiver:

LPI interface

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
N_32	**Engine speed (32RPM resolution)**	**EMS3**	**0280H**	**32**	**8**

Signal definition:

N_32 indicates engine speed in 32 rpm resolution of gasoline ECU.

There is no specific phase relationship between the output and any other signal.

Circuit schematic for signal conditioning: none

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0 .. 8160 rpm = 00H .. FFH

Conversion: (PH) = 32 * (HEX) [rpm]

Receiver of signal and signal features required by the receiver:

LPI interface box

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
MAF	**Mass air flow**	**EMS3**	**0280H**	**40**	**8**

Signal definition:

MAF indicates mass air flow in intake manifold of gasoline ECU.

Circuit schematic for signal conditioning: none

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0 ...1389 mg/TDC = 00H .. FFH

Conversion: (PH) = 5.447 *(HEX) [mg/TDC]

Receiver of signal and signal features required by the receiver:

LPI interface box

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
TIA	**Induction air temperature**	**EMS3**	**0280H**	**48**	**8**

Signal definition:

TIA indicates induction air temperature in gasoline ECU.

There is no specific phase relationship between the output and any other signal.

Circuit schematic for signal conditioning: none

Functional requirements:

Initial value: 00H

Error identifier: FFH

Physical range: -48..+142.5°C = 00H .. FEH

Conversion: (PH) = 0.75 * (HEX) - 48 [°C]

Receiver of signal and signal features required by the receiver:

LPI interface box

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
LV_GSL_MAP	**Indication of AMP or MAP**	**EMS3**	**0280H**	**4**	**1**
MAP	**Manifold Absolute Pressure**	**EMS3**	**0280H**	**56**	**8**
AMP	**Ambient Pressure**	**EMS3**	**0280H**	**56**	**8**

Signal definition:

AMP/MAP signal provides AMP or MAP information alternatively according to LV_GLS_MAP signal. LV_GLS_MAP indicates which information is sent in AMP/MAP signal.

AMP : This signal indicates ambient pressure in gasoline ECU.
MAP : For the μ(Mu) and λ(Lambda) engine system, manifold absolute pressure sensor value is provided.

Functional requirements:

Initial value: 00H

Error identifier: AMP : None
MAP : FFH

Physical range: AMP : 0 … 5412 [hPa] = 00H .. FFH
MAP : 0 ...119.527 [kPa] = 00H .. FEH

Conversion:

LV_GSL_MAP	Function
0	AMP signal send
1	MAP signal send

AMP : (PH) = 21.22 * (HEX) [hPa]
MAP : (PH) = 0.47058 * (HEX) [kPa]

Receiver of signal and signal features required by the receiver:

LPI interface box

Note:

6.2.12 EMS4 Message

Message: EMS4	Identifier: 0545H

Signal Label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
IM_AUTEHN	Authentication "immobilizer"	0	1	00H	-
L_MIL	Lamp "check engine for OBD"	1	1	00H	-
IM_STAT	Status "immobilizer"	2	1	00H	-
AMP_CAN	Atmospheric Pressure	3	5	1CH	1CH
FCO	Fuel consumption	8	16	00H	-
VB	Battery voltage	24	8	00H	FFH
TQI_ACOR_J	Flywheel torque after torque interventions	32	16	0000H	-
TQI_J	Flywheel torque	48	16	0000H	-

Memory layout:

TQI_J (high)				56
TQI_J (low)				48
TQI_ACOR_J (high)				40
TQI_ACOR_J (low)				32
VB				24
FCO (high)				16
FCO (low)				8
AMP_CAN	IM_STAT	L_MIL	IM_AUTEHN	0

Transmission parameters - Conditions

Message	EMS4
System	EMS
Output period	10 ms
Output period tolerance	± 6 ms
Latency	< 5 ms
Remote operation	no
Message Time out	500ms
Message Validity	IGN1
Phase relationship to another message	no

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
IM_AUTEHN	**Authentication "immobilizer"**	**EMS4**	**0545H**	**0**	**1**

Signal definition:

This signal indicates whether Immobilizer is authenticated.

Functional requirements:

Initial value: 00H

Error identifier: --

Range: 00..01H

Conversion:

IM_AUTEHN	Function
0	Unlock
1	Lock

Receiver of signal and signal features required by the receiver:
CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
L_MIL	**Check Engine Lamp or Malfunction Indication Lamp (MIL for CARB/OBDII)**	**EMS4**	**0545H**	**1**	**1**

Signal definition:

The signal indicates the status of the "Check Engine" light. Lamp activation is either effected statically or clocked (500 ms cycle, code sequence).
An evaluation within 10 ms is required to map the activation process as precisely as possible.
In case of a bus timeout, the value 1 has to be assumed.

Functional requirements:

Initial value: 00H

Error identifier: --

Range: 0..01H

Conversion:

L_MIL	Function
0	Check Engine lamp OFF
1	Check Engine lamp ON

Receiver of signal and signal features required by the receiver:

CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
IM_STAT	**Switch, immobilizer**	**EMS4**	**0545H**	**2**	**1**

Signal definition:

Status of immobilizer.

Functional requirements:

Initial value: 00H

Error identifier: --

Range: 0..1H

Conversion:

IM_STAT	Function
0	Immobilizer active
1	Immobilizer passive

Receiver of signal and signal features required by the receiver:

TBD

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
AMP_CAN	**Atmospheric Pressure**	**EMS4**	**0545H**	**3**	**5**

Signal definition:

The value AMP_CAN specifies the atmospheric pressure in the unit [mmHg]. It is calculated from the altitude correction factor MAF_FAC_ALTI_MMV. (Modeling Value)
However, when AMP sensor is equipped, the value AMP_CAN is calculated from the sensor output value.

The Hex-Limits for AMP_CAN are 0 ... 1FH (0 ... 31 dec; 5 Bit) and the physical output is limited to 458.98 ... 792.78 mmHg.

Calculation of AMP_CAN:

AMP_CAN [hex] = (MAF_FAC_ALTI_MMV [dec] - 77 [dec]) * 0.5535714

Functional requirements:

Initial value: 1CH (= 760 mmHg, sea level)

Error identifier: 1CH (Default value under an error condition)

Physical Range: 458.98 ... 791.66 mmHg = 00H ... 1FH

Conversion: (PH) [mmHg] = 10.731613 * (HEX) + 458.98

Receiver of signal and signal features required by the receiver:

TCU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
FCO	**Fuel Consumption signal EMS**	**EMS4**	**0545H**	**8**	**16**

Signal definition:

The EMS uses the signal "FCO" (FUEL CONSUMPTION) to inform other ECUs about the current consumption.
The issued value is a summation of the averaged fuel injection between two subsequent EMS4 messages on the CAN. Due to an output period of 10ms, the FCO signal provides the fuel consumption during 10ms. For more detailed information, please refer to the chapter 'Basic SW Inputs and Outputs' of the software specification.

FCO: Consumption signal via CAN in µl

Representation of the numerical CONSUMPTION value (FCO):
16-bit value with a resolution of 4µl; low-order number on low-order address (L/H),

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0..8388.48 = 0000H .. FFFFH

Conversion: (PH) = 0.128 *(HEX) [µl]

Receiver of signal and signal features required by the receiver:
CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
VB	**Battery voltage**	**EMS4**	**0545H**	**24**	**8**

Signal definition:

The battery voltage after main relay is transferred.

Functional requirements :

Initial value: 00H

Error identifier: FFH

Physical range: 0 ... 25.7969 V = 00H.. FEH

Conversion: (PH) = 26/ 256 * (HEX) [V]

Receiver of signal and signal features required by the receiver:
%%
EPB, FATC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
TQI_ACOR_J	**Flywheel torque after torque intervention**	**EMS4**	**0545H**	**32**	**16**

Signal definition:

The signal TQI_ACOR_J comprises the actual flywheel torque (determined by calculation within the engine management system ; lambda control, knock control, catalyst overheating prevention function, temperature influences, TCS, TCU torque intervention etc. being taken into account).

TQI_ACOR_J can be defined as following equation :

TQI_ACOR_J [Nm] =
TQ_STND [Nm] x (Current Engine Torque after Interventoins[%] – TQFR[%]) / 100[%]

Functional requirements:

Initial value: 0000H

Error identifier: -

Physical range : -3276.8 Nm ..0Nm .. 3276.7 Nm = 8000H .. 0000H .. 7FFFH

Conversion : (PH) = 0.1 * (Signed HEX) [Nm]

Receiver of signal and signal features required by the receiver:

TCU: TCU requires this signal for checking the torque intervention.
Updating: 10 ms.

Note:

TQFR and Negative Torque should be comprised into the TQI_ACOR_J for the RXC and RZD.

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
TQI_J	**Flywheel Torque**	**EMS4**	**0545H**	**48**	**16**

Signal definition:

The signal TQI_J is determined on the basis of flywheel torque as defined by the driver (throttle).
The signal comprises influences, such as the ambient temperature, the atmospheric pressure; it allows for the knock control, the catalyst overheating prevention function and other corrections. This signal does not include TCS and TCU interventions.

TQI_J can be defined as following equation :

TQI_J [Nm] = TQ_STND [Nm] x (Indicated Engine Torque[%] – TQFR[%]) / 100[%]

Functional requirements:

Initial value: 0000H

Error identifier: -

Physical range : -3276.8 Nm ..0Nm .. 3276.7 Nm = 8000H .. 0000H .. 7FFFH

Conversion : (PH) = 0.1 * (Signed HEX) [Nm]

Receiver of signal and signal features required by the receiver:

TCU: TCU requires this signal for checking the torque intervention.
Updating: 10 ms.

Note:

TQFR should be comprised into the TQI_J for the RXC and RZD.

6.2.13 EMS5 Message

Message: EMS5	Identifier: 02A0H

%%

Signal Label	Signal designation	Bit add	Bit ind.	Init value	Error ident.
ECGPOvrd*	Driver override	0	1	00H	-
QECACC*	Failure in SCC-message detected by engine control	1	1	00H	-
ECFail*	Function failure engine power control	2	1	00H	-
SwitchOffCondExt*	SCC shut off conditiom detected	3	1	00H	-
BLCEFail*	Failure brake light switch detected by engine control	4	1	00H	-
AliveCounter	Alive Counter	5	2	00H	-
Byte0Parity	Parity of Byte 0	7	1	-	-
FA_PV_CAN	Filtered Accelerator Pedal Value	8	8	00H	FFH
IntAirTemp	Intake Air Temperature	16	8	00H	FFH
STATE_DC_OBD	Status for rate-based monitoring conditions	24	7	00H	-
INH_DC_OBD	Inhibition of rate-based monitoring	31	1	00H	-
CTR_IG_CYC_OBD	Ignition cycle counter	32	16	0000H	-
CTR_CDN_OBD	General denominator calculation	48	16	0000H	-

Memory layout:

CTR_CDN_OBD (High)							56
CTR_CDN_OBD (Low)							48
CTR_IG_CYC_OBD (High)							40
CTR_IG_CYC_OBD (Low)							32
INH_DC_OBD	STATE_DC_OBD						24
IntAirTemp							16
FA_PV_CAN							8
Byte0Parity	AliveCounter	BLECFail*	SwitchOffCondExt*	ECFail*	QECACC	ECGPOvrd*	0

Transmission parameters - Conditions

Message	EMS5
System	EMS
Output period	10 ms
Output period tolerance	± 6 ms
Latency	max. 5 ms
Remote operation	no
Message Time out	500ms
Message Validity	IGN1
Phase relationship to another message	no

*** NOTE : These signals are for the "SCC(Smart Cruise Control)" system applied vehicles only**

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ECGPOvrd	**Driver Override**	**EMS5**	**02A0H**	**0**	**1**

Signal definition:

ECGPOvrd:
This signal provides bit information whether the demand torque by the driver is higher than the torque requested by SCC system or not. This signal should be set by an engine control system only if the acceleration pedal is actuated by the driver (so that a failure can be avoided when SCC demands loss torque).

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 01H

Conversion:

ECGPOvrd	Function
00H	No Driver Override
01H	Driver Override

Receiver of signal and signal features required by the receiver:
SCC, ESC

Note:
Update Period : 20 ms

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
QECACC	**Failure in SCC message detected by engine control**	**EMS5**	**02A0H**	**1**	**1**

Signal definition:

QECACC:
When it is set, the signal indicates that EMS cannot accept the engine torque request for SCC, TQI_ACC, because of a failure or failures in EMS which may be recovered within the same ignition cycle. EMS stores DTC for the failure.
In case that there is no failure or the failure is cleared, the signal gets reset.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H ... 01H

Conversion:

QECACC	Function
0	No Failure detected
1	Failure detected

Receiver of signal and signal features required by the receiver:
ESC

Note:
Update Period : 20 ms

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ECFail	**Function failure engine power control**	**EMS5**	**02A0H**	**2**	**1**

Signal definition:

ECFail:
When it is set, the signal indicates that EMS cannot accept the engine torque request for SCC, TQI_ACC, because of a failure or failures in EMS which cannot be recovered within the same ignition cycle. EMS stores DTC for the failure.
In case that there is no failure, the signal gets reset.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H ... 01H

Conversion:

ECFail	Function
0	No Failure detected
1	Failure detected

Receiver of signal and signal features required by the receiver:
ESC

Note:
Update Period : 20 ms

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
SwitchOffCondExt	**SCC Shut off condition detected**	**EMS5**	**02A0H**	**3**	**1**

Signal definition:

SwitchOffCondExt:
When it is set, the signal indicates that EMS cannot accept the engine torque request for SCC, TQI_ACC, but it is not related any failures in EMS. Therefore, EMS does not store DTC.
In case that the condition is cleared, the signal gets reset.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H ... 01H

Conversion:

SwitchOffCondExt	Function
0	No switch off condition detected
1	Switch off condition detected

Receiver of signal and signal features required by the receiver:
ESC

Note:
Update Period : 100 ms

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
BLECFail	**Failure brake light switch detected by engine control**	**EMS5**	**02A0H**	**4**	**1**

Signal definition:

BLECFail:
Failure signal to SCC when a failure occurs in the brake light switch acquisition of engine control

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H ... 01H

Conversion:

BLECFail	Function
0	No failure detected
1	Failure detected

Receiver of signal and signal features required by the receiver:
ESC

Note:
Update Period : 100 ms

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
AliveCounter	**Alive Counter**	**EMS5**	**02A0H**	**5**	**2**

Signal definition:

This value is used to verify the continuity of EMS5 message.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0 ... 3 = 00H … 03H

Conversion: (PHYS) = (HEX)

Receiver of signal and signal features required by the receiver:

ESC

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
Byte0Parity	**Parity of Byte 0**	**EMS5**	**02A0H**	**7**	**1**

Signal definition:

This value is used to verify the correct transmission of EMS5.

Functional requirements:

Initial value: -

Error identifier: -

Physical range: 00H ... 01H

Conversion: (PH) = 1 if remainder of ((bit0 + bit1 + bit2 + bit3 + bit4 + bit5 + bit6) / 2) = 0
(PH) = 0 if remainder of ((bit0 + bit1 + bit2 + bit3 + bit4 + bit5 + bit6) / 2) = 1

Receiver of signal and signal features required by the receiver:

ESC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
FA_PV_CAN	**Filtered Accelerator Pedal value**	**EMS5**	**02A0H**	**8**	**8**

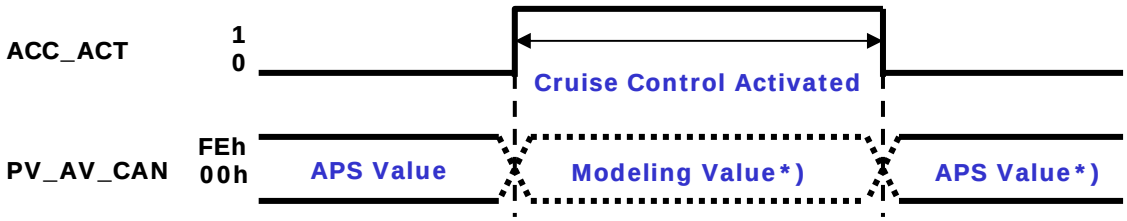
Signal definition:

The signal PV_AV_CAN is a measure of the Accelerator Pedal value.
The accelerator pedal value is determined via 2 pedal sensors, which are connected mechanically to the accelerator pedal. If the EMS-ECU recognizes that the accelerator pedal is not activated, then the value 00 H is carried over on the CAN. If the EMS-ECU detects that the accelerator pedal is fully activated, then FE H is carried over on the CAN bus.

If an error is detected on both pedal sensor channels, this is identified by the value 0FFH.

Signal relationship between ACC_ACT and PV_AV_CAN :

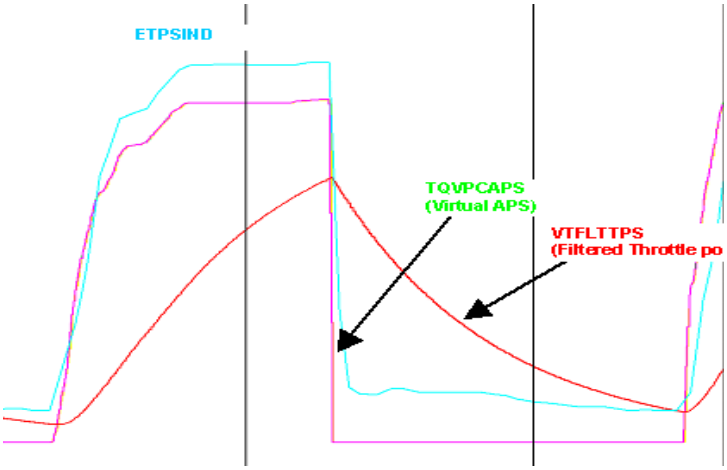
The phase relationship between auto cruise control and PV_AV_CAN is as following figure. If an auto cruise control system is not installed or if cruise control is not activated in auto cruise control system installed vehicle then PV_AV_CAN has actual pedal position value. But if the auto cruise control is activated (actually speed control is performed by EMS), PV_AV_CAN should have modeling value even if a driver does not press the acceleration pedal.



APS Value*) : Acceleration Pedal Sensor value.

Modeling Value*) : Estimated APS value which is calculated by ECU logic considering engine control during the auto-cruise control is activated period. (e.g. estimated throttle value of gasoline engine system or TPS model value of diesel engine system)
And also this value can be used as a driver intension for the shift control of an A/T during auto-cruise control.

This signal can be transferred for the filtered APS with filtering coefficient because of the shift pattern. Function description(Filtering) is as follows.



Filtered Accel pedal value means ramping rate coefficient applied by EMS.
It is based on modeled value(unfiltered APS) to meet desired torque.

Signal relationship between PV_AV_CAN and TPS in DIESEL system :

In a diesel engine vehicle which has an ETC system, basically TPS has APS value. And if auto cruise control is activated then both TPS and PV_AV_CAN should have modeling value which is estimated according to the actual fuel injection and other factors that affect engine torque.

Functional requirements:

Initial value: 00H

Error identifier: FFH

Physical range: 0...99.2% = 00H..FEH

Conversion: PV_AV_CAN (PHYS) = (HEX) * 0.3906[%]

Value	Function
00H	Accelerator Pedal not activated.
FEH	Accelerator Pedal fully activated
FFH	Accelerator Pedal is defective (fail state) or Non-ETC system (APS is not installed)

Receiver of signal and signal features required by the receiver:

TCU, ESC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
IntAirTemp	**Intake air temperature**	**EMS5**	**02A0H**	**16**	**8**

Signal definition:

IntAirTemp indicates intake air temperature of an engine.
A TCU controls oil pressure during gear shifting and also changes an air-con load compensation factor using this signal.

Circuit schematic for signal conditioning: none

Functional requirements:

Initial value: 00H

Error identifier: FFH

Physical range: -48...+142.5°C = 00H .. FEH

Conversion: (PH) = 0.75 * (HEX) - 48 [°C]

Receiver of signal and signal features required by the receiver:
TCU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
STATE_DC_OBD	**Status for Rate-Based Monitoring conditions**	**EMS5**	**02A0H**	**24**	**7**

Signal definition:

For the calculation of the denominators for Rate-Based Monitoring(RBM), CARB defined the standardized vehicle operations, which must be met to increment the denominator counter.
So, this variable is to give a status information(fulfilled or not) about all conditions for the standardized vehicle operations.

STATE_DC_OBD						
Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reserved	Reserved	Maximum altitude condition	Ambient temperature condition	Continuous idle condition	Vehicle speed condition	Minimum trip length condition

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H ... 1FH

Receiver of signal and signal features required by the receiver:
TCU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
INH_DC_OBD	**Inhibirion of Rate-Based Monitoring**	**EMS5**	**02A0H**	**31**	**1**

Signal definition:

This variable is set to 1 if there is a malfunction of any component used to determine the standardized vehicle operations (i.e. vehicle speed, ambient temperature, elevation, idle operation, engine cold start, time of operation, etc.)

Calculations shall resume as soon as the malfunction is no longer present.

If this value is set to 1, the OBD II system shall disable all numerators and denominators calculations

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H ... 01H

Conversion:

INH_DC_OBD	Function
0	Enable of standardized vehicle operation and all numerators/denominators for RBM
1	Inhibition of standardized vehicle operation and all numerators/denominators for RMB

Receiver of signal and signal features required by the receiver:

TCU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CTR_IG_CYC_OBD	**Ignition cycle counter**	**EMS5**	**02A0H**	**32**	**16**

Signal definition:

Number of driving cycle since first ECU power-up.
The counter is incremented each time a driving cycle with engine running for a specified time duration is detected. This value is only initialized with 0 on saved RAM lost (or reprogramming).

Functional requirements:

Initial value: 00H

Error identifier: --

Physical range: 0…65535 = 00H ... FFFFH

Conversion: (PH) = (HEX)

Receiver of signal and signal features required by the receiver:
TCU, ACU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CTR_CDN_OBD	**General denominator calculation**	**EMS5**	**02A0H**	**48**	**16**

Signal definition:

The counter for the general denominator CTR_CDN_OBD is incremented each time a valid driving cycle with standardized vehicle operation is recognized.
The numbers of driving cycles are counted since the first ECU power up. This value is only initialized with 0 on saved RAM lost (or reprogramming).

Functional requirements:

Initial value: 00H

Error identifier: --

Physical range: 0…65535 = 00H ... FFFFH

Conversion: (PH) = (HEX)

Receiver of signal and signal features required by the receiver:
TCU

Note:

6.2.14 EMS6 Message

Message: EMS6	Identifier: 0260H

%%

Signal Label	Signal designation	Bit add	Bit ind.	Init value	Error ident.
TQI_MIN	Minimum indicated engine torque	0	8	00H	-
TQI	Indicated engine torque	8	8	00H	-
TQI_TARGET	Target engine torque	16	8	00H	-
GLOW_STAT	Glow lamp status	24	1	01H	-
CRUISE_LAMP_M	Cruise MAIN switch indication lamp on request	25	1	00H	-
CRUISE_LAMP_S	Cruise SET switch indication lamp on request	26	1	00H	-
PRE_FUEL_CUT_IN	Indication of fuel cut in previous to stop fuel cut off control	27	1	00H	-
ENG_STAT	Engine status	28	3	00H	07H
SOAK_TIME_ERROR	Soak time error	31	1	00H	-
SOAK_TIME	Engine soaking time	32	8	00H	-
TQI_MAX	Maximum indicated engine torque	40	8	00H	-
SPK_TIME_CUR	Current spark timing	48	8	00H	-
Checksum	Checksum	56	4	-	-
AliveCounter	Alive Counter	60	2	00H	-
CF_Ems_AclAct	Accelerator pedal applied	62	2	00H	-

Memory layout:

CF_Ems_AclAct	AliveCounter	Checksum				56
SPK_TIME_CUR						48
TQI_MAX						40
SOAK_TIME						32
SOAK_TIME_ERROR	ENG_STAT	PRE_FUEL_CUT_IN	CRUISE_LAMP_S	CRUISE_LAMP_M	GLOW_STAT	24
TQI_TARGET						16
TQI						8
TQI_MIN						0

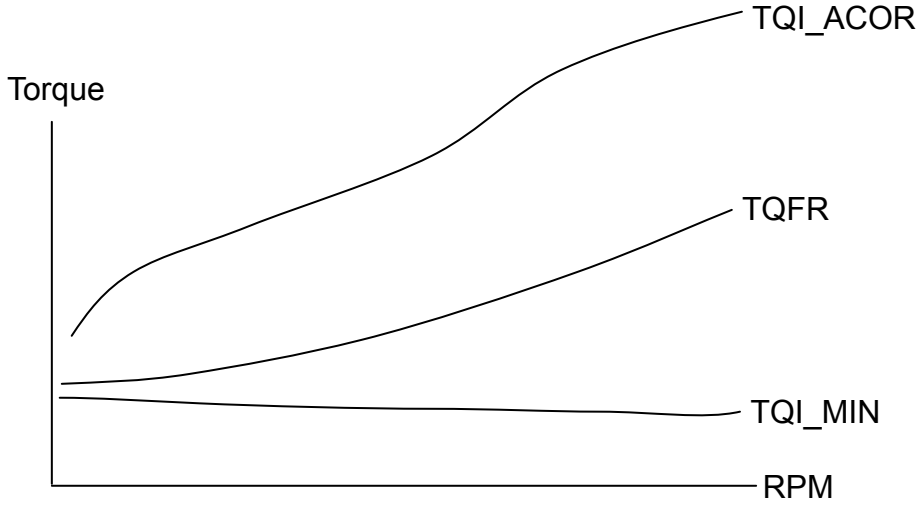
Transmission parameters - Conditions

Message	EMS6
System	EMS
Output period	10 ms
Output period tolerance	± 6 ms
Latency	max. 5 ms
Remote operation	no
Message Time out	500ms
Message Validity	IGN1
Phase relationship to another message	no

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
TQI_MIN	**Minimum indicated engine torque**	**EMS6**	**0260H**	**0**	**8**

Signal definition:

The signal TQI_MIN is the minimum engine torque (minimum air charging rate) which can be fired without misfire including compensation factors such as atmospheric pressure and temperature.
It is not enough to keep the engine running without external power such as inertia.
Firing is impossible below TQI_MIN even if engine is turning by inertia. The friction torque is always greater than TQI_MIN which is almost constant value across engine RPM.
This signal is used to determine when activation of automatic braking is required to achieve a certain deceleration or if the engine deceleration is sufficient under current conditions.



Under normal driving conditions the physical value of this signal is negative:

TQ_MIN[Nm] = (TQI_MIN[%] – TQFR[%]) * TQ_STND[Nm]

The specified torque TQI_x refers to a maximum torque TQ_STND. This conversion into a physical quantity results in a range of 0...99.6094% for TQ_STND.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0..99.6094 % (of TQ_STND) = 00H .. FFH

Conversion: (PH) = 0.390625 * (HEX) [%]

E.g. : If TQI_MIN = FF H, then TQI_MIN (PH) = (0.390625 * FFH) %= 99.6094% of TQ_STND

Receiver:
ESC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
TQI	**Indicated engine torque**	**EMS6**	**0260H**	**8**	**8**

Signal definition:

1) In cars equipped with gasoline engines with ETC system, the signal TQI is determined on the driver's demand including cruise control and other functions and corresponds to the theoretical engine torque. The signal comprises influences, such as the ambient temperature, the atmospheric pressure, knock control, the catalyst overheating prevention function and other corrections but it does not depend on TCS/ESC and TCU interventions realised due to reduction of airflow into the engine cylinders and due to ignition angle adjustment or injection/cylinder shut off.

TQI = f (drivers demand [with the influence of cruise control and other functions without the influence of TCS/ESC and TCU interventions], ignition angle [without the influence of TCS/ESC and TCU interventions])

2) In cars equipped with gasoline engines without ETC system, the signal TQI is determined on the basis of the measured air mass flow (MAF) which corresponds to the theoretical engine. The signal comprises influences, such as the ambient temperature, atmospheric pressure, knock control, the catalyst overheating prevention function and other corrections but it does not depend on TCS/ESC and TCU interventions realised due to ignition angle adjustment or injection/cylinder shut off.

TQI = f (MAF, ignition angle [without the influence of TCS/ESC and TCU interventions])

3) In cars equipped with Diesel engines, the signal TQI is determined on the basis of the driver's demanding injected Diesel amount including cruise control and other functions but does not including the influence of TCS/ESC and TCU interventions. It corresponds to the theoretical engine torque and comprises influences such as the ambient temperature, the atmospheric pressure and other corrections.

TQI = f (injected Diesel amount [without TCS/ESC and TCU interventions])

In case of failures of the load signal (either MAF error or other errors depending on the system configuration), a backup value is generated from specific index tables. The backup value mode is identified by the signal F_SUB_TQI.

There is a specific phase relationship between the signals TQI and F_SUB_TQI.

The specified torque TQI_x refers to a maximum torque TQ_STND. This conversion into a physical quantity results in a range of 0...99.6094% for TQ_STND.

E.g. : If TQI_x = FF H, then TQI_x (PH) = (0.390625 * FFH) %= 99.6094% of TQ_STND

Functional requirements:

Initial value: 00H

Error identifier: by F_SUB_TQI
00H : no error
01H : Error on Torque Measurement

Physical range: 0..99.6094 % (of TQ_STND) = 00H .. FFH

Conversion: (PH) = 0.390625 * (HEX) [%]

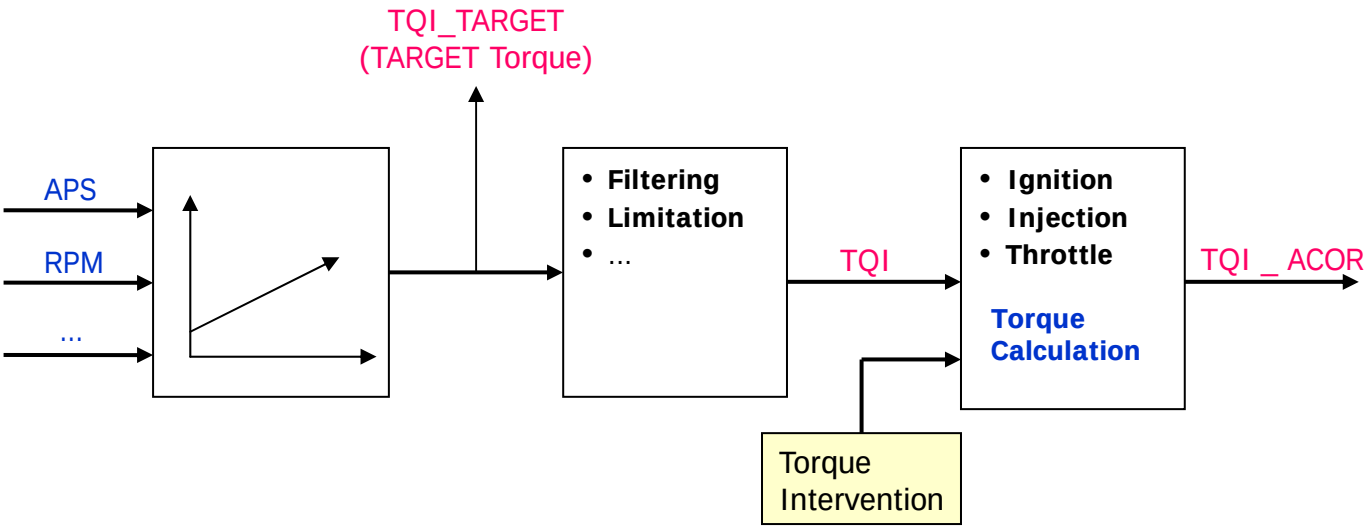
Receiver of signal and signal features required by the receiver:

TCS: Update: < 50 ms
ESC: Update: 20ms
TCU: Signal is used for shift pressure calculation

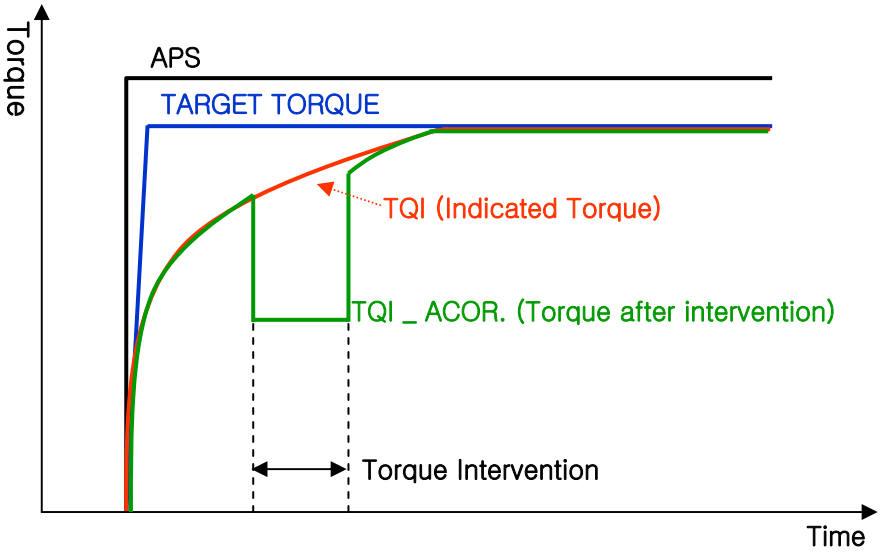
Note:

The concept of torque signals is roughly described as following block diagram.
TQI_TARGET (target torue) would be determined by a torque map with inputs which consist of APS (Acceleration Position Sensor in case of ETC system, i.e. driver's demand) or TPS (without ETC system), RPM (current engine speed) and so on.

TQI (indicated torque) can be determined by the filtering, limitation, and considerations of drivability, protection, dashpot, tip-in and etc with TQI_TARGET as an input.



Following graph rouphly represents this concept.



LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
TQI_TARGET	**Target engine torque**	**EMS6**	**0260H**	**16**	**8**

Signal definition:

The signal TQI_TARGET is determined by an engine torque map with input which consists of acceleration pedal value, MAF sensor, current RPM and etc. This signal reflects driver's demand directly. But it does not depend on torque interventions realised due to reduction of airflow into the engine cylinders and due to ignition angle adjustment or injection/cylinder shut off.

In case of failures of the load signal (either MAF error or other errors depending on the system congiguration), a backup value is generated from specific index tables. The backup value mode is identified by the signal F_SUB_TQI.

There is a specific phase relationship between the signals TQI_TARGET and F_SUB_TQI.

The specified torque TQI_x refers to a maximum torque TQ_STND. This conversion into a physical quantity results in a range of 0...99.6094% for TQ_STND.

E.g. : If TQI_x = FF H, then TQI_x (PH) = (0.390625 * FFH) %= 99.6094% of TQ_STND

Functional requirements:

Initial value: 00H

Error identifier: by F_SUB_TQI
00H : no error
01H : Error on Torque Measurement

Physical range: 0..99.6094 % (of TQ_STND) = 00H .. FFH

Conversion: (PH) = 0.390625 * (HEX) [%]

Receiver of signal and signal features required by the receiver:

TCS: Update: < 50 ms
ESC: Update: 20ms
TCU: Signal is used for shift pressure calculation

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
GLOW_STAT	**Glow lamp status**	**EMS6**	**0260H**	**24**	**1**

Signal definition:

This signal indicates that a status of glow lamp.

Functional requirements:

Initial value: 01H

Error identifier: --

Physical range: 00H .. 01H

Conversion:

GLOW_STAT	Function
00H	Lamp Off
01H	Lamp On

Receiver of signal and signal features required by the receiver:

CLU

Note:
This signal is used for a Diesel or LPI Engine alternatively.

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CRUISE_LAMP_M	**Cruise MAIN switch indication lamp on request**	**EMS6**	**0260H**	**25**	**1**

Signal definition:

This signal indicates that an ECU requests cluster to turn on/off auto-cruise control “MAIN” switch indication lamp.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H .. 01H

Conversion:

CRUISE_LAMP_M	Function
00H	Cruise MAIN switch indication lamp turn OFF
01H	Cruise MAIN switch indication lamp turn ON

Receiver of signal and signal features required by the receiver:

CLU

Note:

This signal is for the CAN-type cluster installed vehicled only.

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CRUISE_LAMP_S	**Cruise SET switch indication lamp on request**	**EMS6**	**0260H**	**26**	**1**

Signal definition:

This signal indicates that an ECU requests cluster to turn on/off auto-cruise control “SET” switch indication lamp.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H .. 01H

Conversion:

CRUISE_LAMP_S	Function
0	Cruise SET switch indication lamp turn OFF
1	Cruise SET switch indication lamp turn ON

Receiver of signal and signal features required by the receiver:

CLU

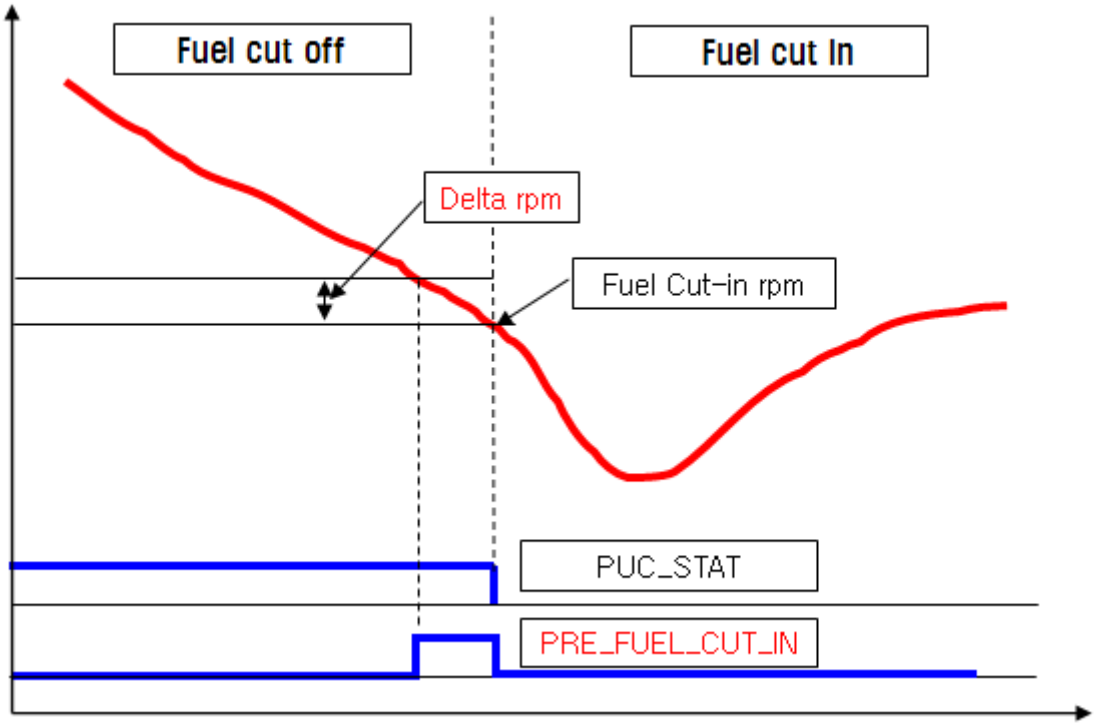
Note:

This signal is for the CAN-type cluster installed vehicled only.

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
PRE_FUEL_CUT_IN	**Indication of fuel cut in previous to stop fuel cut off control**	**EMS6**	**0260H**	**27**	**1**

Signal definition:

During coast lock up control of TCU, if there occur a fuel cut in control suddenly then shift shock can happen. To prevent this, it is needed to inform fuel cut in control previously to TCU to release damper lock up before fuel cut in control start.



Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H .. 01H

Conversion:

PRE_FUEL_CUT_IN	Function
0	Continue to fuel cut off control.
1	Indication of fuel cut in previous to stop fuel cut off

Receiver of signal and signal features required by the receiver:

TCU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ENG_STAT	**Engine status**	**EMS6**	**0260H**	**28**	**3**

Signal definition:

This signal indicates that a status of engine.

Functional requirements:

Initial value: 00H

Error identifier: 07H

Physical range: 00H .. 07H

Conversion:

ENG_STAT	Function
00H	Engine Stop
01H	Cranking
02H	Stalled
03H	Running
04H	Reserved
05H	Reserved
06H	Reserved
07H	Fault

Receiver of signal and signal features required by the receiver:
%%
CLU, EPB

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
SOAK_TIME_ERROR	**Soak time error**	**EMS6**	**0260H**	**31**	**1**

Signal definition:

This signal indicates that information on soak time error.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H .. 01H

Conversion:

SOAK_TIME_ERROR	Function
0	No Failure detected
1	Failure detected

Receiver of signal and signal features required by the receiver:
%%
LPI interface box, TCU, FATC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
SOAK_TIME	**Engine soaking time**	**EMS6**	**0260H**	**32**	**8**

Signal definition:

The Signal SOAK_TIME means the duration from Engine Ignition Off to Ignition On.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0..255 Min = 00H .. FFH

Conversion: (PH) = 1 * (HEX) [Min]

Receiver of signal and signal features required by the receiver:
%%
LPI interface box, TCU, FATC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
TQI_MAX	**Maximum indicated engine torque**	**EMS6**	**0260H**	**40**	**8**

Signal definition:

The signal TQI_MAX is the current maximum indicated engine torque. This signal reflects the maximum engine torque under current conditions (engine speed, etc…).

Note : TQI_MAX must be transmitted actual engine torque including COT, thermal/spark efficiency etc..
This means that the TQI_ACOR can reach to the TQI_MAX.
If not possible, thTQI_MAX should be " FFH" (99.6%) to reduce TCS/ESC variant.

TQ_MAX[Nm] = (TQI_MAX[%] – TQFR[%]) * TQ_STND[Nm]

The specified torque TQI_x refers to a maximum torque TQ_STND. This conversion into a physical quantity results in a range of 0...99.6094% for TQ_STND.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0..99.6094 % (of TQ_STND) = 00H .. FFH

Conversion: (PH) = 0.390625 * (HEX) [%]

E.g. : If TQI_MAX = FF H, then TQI_MAX (PH) = (0.390625 * FFH) %= 99.6094% of TQ_STND

Receiver of signal and signal features required by the receiver:

TCS/ESC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
SPK_TIME_ CUR	**Current spark timing**	**EMS6**	**0260H**	**48**	**8**

Signal definition:

This signal indicates output value of final spark timing from ECU which reflects torque intervention requests by ESC(TCS), SCC and TCU.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: -35.625˚ … 0˚ = 00H .. 5FH (Retard)
0.375˚ … 60˚ = 60H .. FFH (Advance)

Conversion: (PH)=((HEX)-5FH) * 0.375 [˚] (Advance)
(PH)=(5FH-(HEX)) *(- 0.375) [˚] (Retard)

Receiver of signal and signal features required by the receiver:

TCU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
Checksum	**Checksum**	**EMS6**	**0260H**	**56**	**4**

Signal definition:

This value is used to verify the correct transmission of EMS6.

Functional requirements:

Initial value: -

Error identifier: -

Physical range: 0 ... 15 = 00H … FH

Conversion: 10H – (Least Significant Nibbles of (Byte0 + Byte1 + Byte2 + Byte3 + Byte 4 + Byte5 + Byte6) + Most Significant Nibbles of (Byte0 + Byte1 + Byte2 + Byte3 + Byte4 + Byte5 + Byte6 + Byte7))

Receiver of signal and signal features required by the receiver:

ESC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
AliveCounter	**Alive Counter**	**EMS6**	**0260H**	**60**	**2**

Signal definition:

This value is used to verify the correct transmission of EMS6.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0 … 3 = 00H ... 03H

Conversion: (PH) = (HEX)

Receiver of signal and signal features required by the receiver:

ESC

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Ems_AclAct	**Accelerator pedal applied**	**EMS6**	**0260H**	**62**	**2**

Signal definition:

This signal indicates if the driver applies the accelerator pedal.
The signal always indicates the actual operation of the accelerator pedal, independent from SCC mode.

Functional requirements:

Initial value: 00H

Error identifier: 03H

Physical range: 00H .. 03H

Conversion:

CF_Ems_AclAct	Function
00H	Accelerator pedal not pressed
01H	Accelerator pedal pressed
02H	Reserved
03H	Accelerator pedal position sensor failure

Receiver of signal and signal features required by the receiver:

ESC

Note:

6.2.15 EMS_H2 Message

Message: EMS_H2	Identifier: 018FH

@@ %%

Signal label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
R_TqAcnApvC	Max torque limitation of A/C compressor	0	8	00H	FFH
R_PAcnC	APT Sensor output value	8	8	00H	FFH
TQI_B	Indicated engine torque	16	8	00H	-
SLD_VS	Speed limiter vehicle speed	24	8	00H	FFH
Reserved	Reserved	32	3	00H	-
CF_Ems_IsgStat	Status of ISG	35	3	00H	-
CF_Ems_OilChg	Oil Level Lamp	38	1	00H	-
CF_Ems_EtcLimpMod	ETC Limphome Mode flag	39	1	00H	-
R_NEngIdlTgC	Engine Idle Target Speed	40	8	00H	FFH
CF_Ems_UpTarGr	Target Gear of Upshift	48	1	00H	-
CF_Ems_DownTarGr	Target Gear of Downshift	49	1	00H	-
CF_Ems_DesCurGr	Desirable Gear of Current	50	4	00H	0FH
CF_Ems_SldAct	Speed limiter device in activation	54	1	00H	-
CF_Ems_SldPosAct	Positive action at speed limiter function on request	55	1	00H	-
CF_Ems_HPresStat	Fuel Tank High Pressure Status	56	1	00H	-
Free	Free	57	8	00H	-

Memory layout :

Free				CF_Ems_HPresStat	56
CF_Ems_SldPosAct	CF_Ems_SldAct	CF_Ems_DesCurGr	CF_Ems_DownTarGr	CF_Ems_UpTarGr	48
R_NEngIdlTgC					40
CF_Ems_EtcLimpMod	CF_Ems_OilChg	CF_Ems_IsgStat	Reserved		32
SLD_VS					24
TQI_B					16
R_PAcnC					8
R_TqAcnApvC					0

Transmission parameters - Conditions

Message	EMS_H2
System	EMS
Output period	10ms
Output period tolerance	± 6 ms
Latency	max. 5 ms
Remote operation	no
Message Time out	500ms
Message Validity	IGN1
Phase relationship to another message	no

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
R_TqAcnApvC	**Max torque limitation of A/C compressor**	**EMS_H2**	**018FH**	**0**	**8**

Signal definition:

EMS defines the maximum allowed A/C compressor torque for drivability and engine safety.

This signal offered to A/C ECU unit only in case of the external variable A/C system installed vehicle.

%%
Functional requirements:

Initial value: 00H

Error identifier: FFH

Physical range: 0 Nm….. ~~25.4~~ 50.8 Nm = 00H .. FEH

Conversion: (PH) = ~~0.1~~ 0.2 * (HEX) [Nm]

Receiver of signal and signal features required by the receiver:

CLU, FATC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
R_PAcnC	**APT sensor output value**	**EMS_H2**	**018FH**	**8**	**8**

Signal definition:

An EMS senses A/C pitot-tube pressure (between compressor & evaporator) directly with APT sensor. This signal offered to A/C ECU only in case of the external variable A/C system installed vehicle.

Functional requirements:

Initial value: 00H

Error identifier: FFH

Physical range: 0 hPa….. 31,750 hPa = 00H .. FEH

Conversion: (PH) = 125 * (HEX) [hPa]

Receiver of signal and signal features required by the receiver:

CLU, FATC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
TQI_B	**Indicated engine torque**	**EMS_H2**	**018FH**	**16**	**8**

Signal definition:

TQI_B = f (actual torque + with the influence of TCS/ESC [without the influence of TCU interventions])
In cars equipped with gasoline engines with ETC system, the signal TQI is determined on actual torque. The signal comprises influences, such as the ambient temperature, the atmospheric pressure, knock control, the catalyst overheating prevention function and other corrections but it does not include TCU interventions realised due to reduction of airflow into the engine cylinders and due to ignition angle adjustment or injection/cylinder shut off. But the signal does include TCS/ESC interventions.

E.g. : If TQI_x = FF H, then TQI_x (PH) = (0.390625 * FFH) %= 99.6094% of TQ_STND

Functional requirements:

Initial value: 00H

Error identifier: by F_SUB_TQI
00H : no error
01H : Error on Torque Measurement

Physical range: 0..99.6094 % (of TQ_STND) = 00H .. FFH

Conversion: (PH) = 0.390625 * (HEX) [%]

Receiver of signal and signal features required by the receiver:

TCU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
SLD_VS	**Speed limiter vehicle speed**	**EMS_H2**	**018FH**	**24**	**8**

Signal definition:

The vehicle speed which is measured by the EMS has to be sent to CLUSTER. This value is used for limiting speed of EMS.
EMS limite vehicle speed as this value

Functional requirements:

Initial value: 00H

Error identifier: FFH

Physical range: 0 .. 254 km/h = 00H .. FEH

Conversion: (PH) = 1 * (HEX) [km/h]

Receiver of signal and signal features required by the receiver:

CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Ems_IsgStat	**Status of ISG**	**EMS_H2**	**018FH**	**35**	**3**

Signal definition:

This signal informed ISG status like active, prohibited, fault, or automatically started

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H ... 07H

Conversion:

CF_Ems _IsgStat	Function	Cluster Action
00H	ISG is not operating Normal engine operating without ISG	ISG lamp turn off
01H	Idle stop is activated Idle is stopped by ECU during driving	ISG lamp turn on
02H	Automatically started by ECU Engine is automatically started by ECU regardless driver's volition during idle stop because the condition that ISG function to be prohibited is satisfied, for example SOC is too low.	ISG lamp blinking during 30 second.(1Hz)
03H	ISG is prohibited Driver prohibits to activate ISG in order to avoid start lag when he met traffic jam for example.	ISG prohibit lamp turn on (If ISG prohibit lamp doesn't involved in the CLUSTER unit, then this lamp would be controlled by ECU directly.)
04H	Fault is existing in ISG There is fault, which is related with ISG. So, idle stop is prohibited and engine started automatically if it is idle stop condition.	ISG prohibit lamp blinking during faulty.(1Hz) (If ISG prohibit lamp doesn't involved in the CLUSTER unit, then this lamp would be controlled by ECU directly.)
05H	Reserved	
06H	Reserved	
07H	Reserved	

Receiver of signal and signal features required by the receiver:
CLU, MDPS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Ems_OilChg	**Oil Level Lamp**	**EMS_H2**	**018FH**	**38**	**1**

Signal definition:

This signal indicates the replace time of engine oil.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H ... 01H

Conversion:

CF_Ems_OilChg	Function
00H	OIL LEVEL LAMP Off
01H	OIL LEVEL LAMP On

Receiver of signal and signal features required by the receiver:

CLU

Note:

@@

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Ems_EtcLimpMod	**ETC Limphome Mode flag**	**EMS_H2**	**018FH**	**39**	**1**

Signal definition:

When ETC Mal-function occurred, EMS requests Cluster to indicate limphome mode driving and inform driver to go to AS center as soon as possible.
- In case of ETC malfunction, EMS finishes ETC control so that a vehicle goes to limphome mode driving (Forced idle). Since sudden vehicle speed decrease can cause uncomfortable feeling to driver, EMS needs to indicate limphome mode condition on Cluster to induce driver to go to AS center as soon as possible.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H ... 01H

Conversion:

CF_Ems_EtcLimpMod	Function
00H	Engine control is available
01H	ETC Limphome mode by ECU

Receiver of signal and signal features required by the receiver:

CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
R_NEngIdlTgC	**Engine Idle Target Speed**	**EMS_H2**	**018FH**	**40**	**8**

Signal definition:

The stationary target speed depends principally of the engine coolant temperature.
There is a difference between the target speed for manual transmission MT and automatic transmission (AT) in 'neutral' and AT in 'drive'.

- Immediately after start the catalyst heating function may increase the target speed
- The battery charge monitoring increase the target speed.
- For A/C use the target speed may be increased

Functional requirements:

Initial value: 00H

Error identifier: FFH

Physical range: 0 .. 2540 rpm = 00H .. FEH

Conversion: (PH) = 10 * (HEX) [rpm]

Receiver of signal and signal features required by the receiver:
%%
TCU, FATC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Ems_UpTarGr	**Target Gear of Upshift**	**EMS_H2**	**018FH**	**48**	**1**

Signal definition:

This signal represents gear shift up display status. EMS transmits gear shift up status to the cluster.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H ... 01H

Conversion:

CF_Ems_UpTarGr	Function
0	Gear Shiftup Display Off
1	Gear Shiftup Display On

Receiver of signal and signal features required by the receiver:
CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Ems_DownTarGr	**Target Gear of Downshift**	**EMS_H2**	**018FH**	**49**	**1**

Signal definition:

This signal represents gear shift down display status. EMS transmits gear shift down status to the cluster.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H ... 01H

Conversion:

CF_Ems_DownTarGr	Function
0	Gear Shiftdown Display Off
1	Gear Shiftdown Display On

Receiver of signal and signal features required by the receiver:
CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Ems_DesCurGr	**Desirable Gear of Current**	**EMS_H2**	**018FH**	**50**	**4**

Signal definition:

This signal represents desirable gear position of current driving condition.
EMS transmits desirable gear position to the cluster.

Functional requirements:

Initial value: 00H

Error identifier: 0FH

Physical range: 00H ... 0EH

Conversion:

CF_Ems_DesCurGr	Function
00H	No display
01H	Gear Position "1" display
02H	Gear Position "2" display
03H	Gear Position "3" display
04H	Gear Position "4" display
05H	Gear Position "5" display
06H	Gear Position "6" display
07H	Reserved
08H	Reserved
09H	Reserved
0AH	Reserved
0BH	Reserved
0CH	Reserved
0DH	Reserved
0EH	Reserved

Receiver of signal and signal features required by the receiver:
CLU

Note:

@@

LABEL	Designation	Message	Identifier	Bit add.	Bit lnd.
CF_Ems_SldAct	**Speed limiter device in activation**	**EMS_H2**	**018FH**	**54**	**1**

Signal definition:

This signal indicates that if speed limiter function is active or not.
If the speed limiter function is activated then CF_Ems_SldAct = 1.
Although “SLD Main” switch is on, if the Speed limiter function is deactivated then CF_Ems_SldAct should be set to ‘0’.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H ... 01H

Conversion:

CF_Ems_SldAct	Function
0	Speed limiter function is not active
1	Speed limiter function is active

Receiver of signal and signal features required by the receiver:
CLU

Note:

@@

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Ems_SldPosAct	**Positive action at speed limiter function on request**	**EMS_H2**	**018FH**	**55**	**1**

Signal definition:

This signal indicates that if positive action of a driver at speed limiter function is active or not. If the positive action is activated then CF_Ems_SldPosAct = 1, which let the current vehicle speed to exceed the limit speed set from a driver.
If kick-down switch isn't connected to engine ECU directly, ECU can recognize the positive action of a driver from accel pedal position indirectly.
When current vehicle speed exceeds the limit speed, vehicle reaction should be distinguished (e.g. lamp reaction or audio warning signal reaction) depending on the status of "CF_Ems_SldPosAct"

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H ... 01H

Conversion:

CF_Ems_SldPosAct	Function
0	Positive action is not active
1	Positive action is active

Receiver of signal and signal features required by the receiver:
CLU

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Ems_HPresStat	**Fuel Tank High Pressure Status**	**EMS_H2**	**018FH**	**56**	**1**

Signal definition:

This signal indicates that if fuel tank is high Pressure or not.
If the fuel tank is in high pressure status then CF_Ems_HPresStat = '1'.
If the fuel tank isn't in high pressure status then CF_Ems_HPresStat should be set to '0'.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H ... 01H

Conversion:

CF_Ems_HPresStat	Function
0	Fuel Tank is not in high Pressure
1	Fuel Tank is in high Pressure

Receiver of signal and signal features required by the receiver:
TCU

Note:

6.2.16 TCU1 Message

Message: TCU1	Identifier: 043FH

Signal Label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
TAR_GC	Target of gear change	0	3	00H	-
SWI_GS	Gearchange active	3	1	00H	-
F_OBD	OBD-relevant error in TCU	4	1	00H	-
TCU_STAT	Status TCU	5	1	00H	-
SWI_CC	Converter lockup clutch	6	2	00H	-
G_SEL_DISP	Gear selector display	8	4	09H	0FH
F_TCU	TCU fault	12	2	00H	-
TCU_TYPE	Control unit type	14	2	00H	-
TCU_OBD	OBD status, transmission control	16	4	00H	-
GEAR_TYPE	Number of gear steps of A/T	20	4	00H	-
TQI_TCU	Torque intervention of TCU, referred to the indicated engine torque	24	8	FFH	FFH
TEMP_AT	A/T fluid temperature	32	8	FFH	FFH
N_TC	Torque converter turbine speed	40	16	0000H	FFFEH
TQI_TCU_INC	TCU requested engine RPM increase	56	8	00H	-

Memory layout:

TQI_TCU_INC					56
N_TC (High)					48
N_TC (Low)					40
TEMP_AT					32
TQI_TCU					24
GEAR_TYPE			TCU_OBD		16
TCU_TYPE	F_TCU		G_SEL_DISP		8
SWI_CC	TCU_STAT	F_OBD	SWI_GS	TAR_GC	0

Transmission parameters - Conditions

Message	TCU1
System	TCU
Output period	10ms
Output period tolerance	-
Latency	max 5 ms
Remote operation	no
Message Time out	500ms
Message Validity	IGN1
Phase relationship to another message	no

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
TAR_GC	**Target gear**	**TCU1**	**043FH**	**0**	**3**
SWI_GS	**Gearchange active**	**TCU1**	**043FH**	**3**	**1**

Signal definition:

TAR_GC informs about the speed, which is currently engaged in the gearbox, or, in case of a gear change (SWI_GS), which speed is reached.
Note: Gear changes covering more than one speed are also possible.
In the P and N positions, the frictional connection is interrupted hydraulically.
Depending on the type of error, the 3rd or 4th (forward) speed, and the R (reverse) speed are engaged in the limp home program.

SWI_GS indicates whether a gear change is being executed in the gearbox.
Note : Gear change means a gear shift at D-range and Garage shift(PRND).

Functional requirements:

Initial value: TAR_GC: 00H
SWI_GS: 00H

Error identifier: -

Physical range: TAR_GC: 0..7 = 00H .. 07H
SWI_GS: 0..1 = 00H .. 01H

Conversion:

TAR_GC	Function
00H	if N or P are detected (no frictional connection)
01H	1st speed
02H	2nd speed
03H	3rd speed
04H	4th speed
05H	5th speed (if provided)
06H	More than 6th speed (if provided)
07H	Reverse speed
SWI_GS	**Function**
00H	no gear change
01H	gear change is active

Receiver of signal and signal features required by the receiver:

ESC, SCC

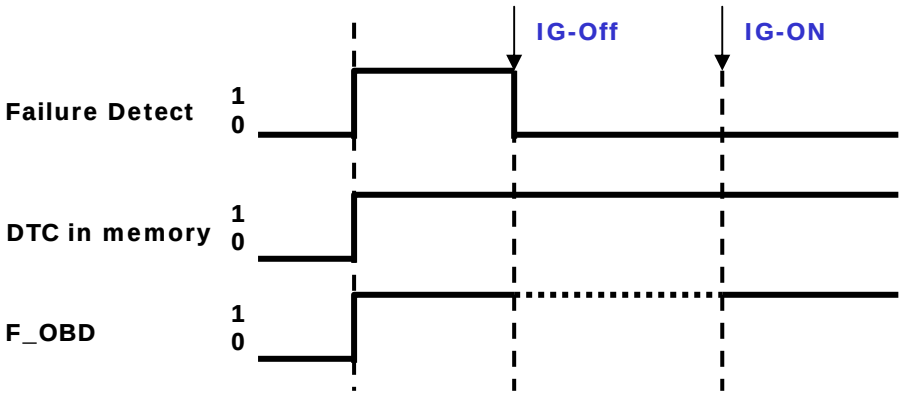
Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
F_OBD	**OBD-relevant error in TCU**	**TCU1**	**043FH**	**4**	**1**

Signal definition:

Informs about the presence of an OBD-relevant error in the TCU.

When an OBD-relevant error detected F_OBD is set to 1 and the related DTC(s) would be recorded into non-volatile memory. Even if the error is not detected currently, F_OBD should be set to 1 as long as DTC exists in memory.



Functional requirements:

Initial value: 00H

Error identifier: --

Physical range: 00H .. 01H

Conversion:

F_OBD	Function
0	no error present
1	OBD error present

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
TCU_STAT	**Status TCU**	**TCU1**	**043FH**	**5**	**1**

Signal definition:

Status of TCU.
This label is a logical value, whereas „1“ represents actuator test. During actuator test each of the transmission actuators is checked by the diagnostic tester. Engine unit should be stopped and ignition key „on“ during the test.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H .. 01H

Conversion:

TCU_STAT	Function
0	normal
1	actuator test in process

Receiver of signal and signal features required by the receiver:

TBD

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
SWI_CC	**converter lockup clutch**	**TCU1**	**043FH**	**6**	**2**

Signal definition:

Status converter clutch

There is no specific phase relationship between the output and any other signal.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0..3 = 00H..03H

Conversion:

SWI_CC	Function
00H	No lock up control
01H	Slip lock up
02H	Fully lock up
03H	Off slip lock up

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
G_SEL_DISP	**gear selector display**	**TCU1**	**043FH**	**8**	**4**

Signal definition:

Position (P, R, N..), which was identified by the gear selector.

In case the gear selector is in a intermediate position, the last clear recognized position is used.

There is no specific phase relationship between the output and any other signal.

Functional requirements:

Initial value: 09H

Error identifier: 0FH

Physical range: 00..15 = 00..0FH

Conversion:

Value	Function
00H	P
01H	L
02H	2
03H	3
04H	not used
05H	D
06H	N
07H	R
08H	sports mode / manual shift
09H	Not Display at Cluster
0AH	Sub-Rom Communication
0BH	Sub-Rom Communication Error
0CH	Reserved
0DH	Reserved
0EH	Intermediate Position
0FH	fault

Receiver of signal and signal features required by the receiver:
%%
AFLS, SCC, ECS, CLU, PGS, SPAS, EPB

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
F_TCU	**TCU fault status**	**TCU1**	**043FH**	**12**	**2**

Signal definition:

Status of transmission control.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H .. 03H

Conversion:

F_TCU	Function
0	no failure
1	diagnostic failure in TCU
2	diagnostic failure in TCU, limp home activated
3	not used

Receiver of signal and signal features required by the receiver:

EMS, ESC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
TCU_TYPE	**Control unit type**	**TCU1**	**043FH**	**14**	**2**

Signal definition:

Information regarding the type of transmission – Step A/T or CVT or DCT.

Functional requirements:

Initial value: 00H

Error identifier: --

Physical range: 00H .. 03H

Conversion:

TCU_TYPE	Function
00H	Reserved
01H	Step A/T
02H	CVT
03H	DCT

Receiver of signal and signal features required by the receiver:

EMS, ESC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
TCU_OBD	**OBD II status of transmission control**	**TCU1**	**043FH**	**16**	**4**

Signal definition:

The signal TCU_OBD is used to inform the OBD master (EMS-ECU) in case a OBD relevant fault is detected. According to the OBD regulations the TCU could request MIL on, MIL blinking and freeze frame storage. If a freeze frame request by the TCU has not been acknowledged (OBD_FRF_ACK) within 2 seconds, this request has to be canceled.

-> Related signal : See “EngFrzFrm” message

.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0..0FH

Conversion:

Bit 3 MIL blinking request	Bit 2 MIL on request	Bit 1 freeze frame request	Bit 0 readiness info

Receiver of signal and signal features required by the receiver:

EMS

Note:

The exact meaning of this signals and under which conditions they are used has to be defined by the TCU supplier (in accordance with the OBD II regulations).

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
GEAR_TYPE	**Number of gear steps of A/T**	**TCU1**	**043FH**	**20**	**4**

Signal definition:

This signal indicates number of gear steps of step type automatic transmission(A/T). A vehicle can have A/T variant according to its option, for example 4-speed A/T or 5-speed A/T can be equipped in the same kind of vehicles and other control systems (e.g. ESC, TCS, …) can need this information to apply appropriate control logic.

Functional requirements:

Initial value: Appropriate value of A/T

Error identifier: --

Physical range: 00H .. 0FH

Conversion:

Gear_Type	Function
00H~02H	Reserved
03H	3 – Speed A/T
04H	4 – Speed A/T
05H	5 – Speed A/T
06H	6 – Speed A/T
07H~0FH	Reserved

Receiver of signal and signal features required by the receiver:

ESC

Note:

The CVT (Continuously Variable Transmission) should set this signal to 00H.

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
TQI_TCU	**TCU requested engine torque reduction**	**TCU1**	**043FH**	**24**	**8**

Signal definition:

The TCU requests a torque reduction via the signal TQI_TCU to the EMS.

The requested torque TQI_TCU refers to a maximum torque TQ_STND. This conversion into a physical quantity provides a range of TQ_STND of 0..99.6094%.

There is no specific phase relationship between the output and any other signal.

Functional requirements:

If there is no intervention, the passive value is transferred.

Passive:	FFH	
Initial value:	FFH	
Physical range:	TQI_TCU:	0..99.6094% = 00H .. FFH
Conversion:	TQI_TCU: 00H: FFH:	(PH) = 0.390625 * (HEX) [%] max. reduction; no reduction

Receiver of signal and signal features required by the receiver:

EMS, TCS

Note:

TQI_TCU is not relevant to RXC & RZD.

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
TEMP_AT	**temperature A/T fluid**	**TCU1**	**043FH**	**32**	**8**

Signal definition:

Transmission fluid temperature in TCU sensed via an A/D converter;
converted into degrees centigrade (°C).

There is no specific phase relationship between the output and any other signal.

Circuit schematic for signal conditioning: none

Functional requirements:

Initial value: FFH

Error identifier: FFH

Physical range: -40 .. 214 °C = 00H .. FEH

Conversion: (PH) = 1.00 * (HEX) - 40 [°C]

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
N_TC	**Torque converter turbine speed**	**TCU1**	**043FH**	**40**	**16**

Signal definition:

N_TC represents the speed of the torque converter turbine of the gearbox at gearbox-side.

Circuit schematic for signal conditioning: none

Functional requirements:

Initial value: 0000H

Error identifier: FFFFH

Physical range: 0 .. 16383.5 rpm = 0000H .. FFFEH

Conversion: (PH) = 0.25 * (HEX) [rpm]

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
TQI_TCU_INC	**TCU requested engine RPM increase**	**TCU1**	**043FH**	**56**	**8**

Signal definition:

The TCU requests the engine RPM increase via the signal TQI_TCU_INC to the EMS..

The requested torque TQI_TCU_INC refers to maximum torque TQ_STND. This conversion into a physical quantity provides a range of TQ_STND of 0..99.6094%.

Functional requirements:

If there is no increasing request, the passive value is transferred.

Initial value: 00H

Physical range: TQI_TCU_INC: 0..99.6094% = 000H .. FFH

Conversion: TQI_TCU_INC: (PH) = 0.390625 * (HEX) [%]
00H: No request
FFH: Max. Increase

Receiver of signal and signal features required by the receiver:

EMS, TCS/ESC

Note:

6.2.17 TCU2 Message

Message: TCU2	Identifier : 0440H

Signal Label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
ETL_TCU	TCU requests engine torque limit(ETL)	0	8	FFH	-
CUR_GR	Current Gear	8	4	00H	-
CF_Tcu_Alive	Alive Counter	12	2	00H	-
CF_Tcu_ChkSum	Checksum	14	2	00H	-
VS_TCU	Vehicle Speed calculated by TCU	16	8	00H	FFH
FAN_CTRL_TCU	Cooling fan control request by TCU	24	2	00H	-
BRAKE_ACT_TCU	Indication of brake switch on/off signal by TCU	26	2	01H	03H
FUEL_CUT_TCU	Fuel cut request during garage shift	28	1	00H	-
INH_FUEL_CUT	Inhibition of engine fuel cut off	29	1	00H	-
IDLE_UP_TCU!	TCU requests engine idle RPM up	30	1	00H	-
N_INC_TCU	Engine speed increasing requirement flag	31	1	00H	-
SPK_RTD_TCU	Requested spark retard angle from TCU	32	8	FFH	-
N_TC_RAW	Unfiltered Torque converter turbine speed	40	16	0000H	FFFFH
VS_TCU_DECIMAL	The value below decimal point of vehicle speed	56	8	00H	00H

Memory layout:

<table>
<tr><td colspan="6">VS_TCU_DECIMAL</td><td>56</td></tr>
<tr><td colspan="6">N_TC_RAW (MSB)</td><td>48</td></tr>
<tr><td colspan="6">N_TC_RAW (LSB)</td><td>40</td></tr>
<tr><td colspan="6">SPK_RTD_TCU</td><td>32</td></tr>
<tr><td>N_INC_TCU</td><td>IDLE_UP_TCU!</td><td>INH_FUEL_CUT</td><td>FUEL_CUT_TCU</td><td>BRAKE_ACT_TCU</td><td>FAN_CTRL_TCU</td><td>24</td></tr>
<tr><td colspan="6">VS_TCU</td><td>16</td></tr>
<tr><td colspan="2">CF_Tcu_ChkSum</td><td colspan="2">CF_Tcu_Alive</td><td colspan="2">CUR_GR</td><td>8</td></tr>
<tr><td colspan="6">ETL_TCU</td><td>0</td></tr>
</table>

Transmission parameters - Conditions

Message	TCU2
System	TCU
Output period	10ms
Output period tolerance	-
Latency	max 5 ms
Remote operation	no
Message Time out	500ms
Message Validity	IGN1
Phase relationship to another message	no

! THIS SIGNAL IS FOR “LAMBDA ENGINE” SYSTEM ONLY.

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ETL_TCU	**TCU requests engine torque limit(ETL)**	**TCU2**	**0440H**	**0**	**8**

Signal definition:

The TCU requests a engine torque limit(ETL) from the EMS.
There is no time limitation of the intervention.

TCU requests engine torque limit below the TCU requesting torque.

The engine torque request signal means the absolute torque limitation.

TCU sends it through CAN system and makes it change every moment.
In any non-requesting situations, TCU sends the maximum value of CAN message.

ETL_TCU is used in the following item.

[ETL_TCU 1] Torque down control on stall and usual conditions
[ETL_TCU 2] Torque down control in stepping when selected

Functional requirements:

If there is no intervention, the passive value is transferred.

Passive: FFH

Initial value: FFH

Physical range: 0 Nm .. 508Nm = 00H .. FEH ---- ① or
0 Nm .. 762Nm = 00H .. FEH ---- ②

Conversion: (PH) = 2 * (HEX) [Nm] ---- ① or
(PH) = 3 * (HEX) [Nm] ---- ②
00H : Max. reduction
FFH : No reduction

Receiver of signal and signal features required by the receiver:

EMS

Note:

Conversion rule ② is applied for the engine which maximum engine torque is higher than 520 Nm.

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CUR_GR	**Current Gear**	**TCU2**	**0440H**	**8**	**4**

Signal definition:

CUR_GR indicates the gear speed which is currently engaged in the gearbox.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0..15 = 0H .. FH

Conversion:

CUR_GR	Function
0H	if N or P are detected (No frictional connection)
1H	1st speed
2H	2nd speed
3H	3rd speed
4H	4th speed
5H	5th speed
6H	6th speed
7H	7th speed
8H	8th speed
9H~DH	Reserved
EH	Reverse speed
FH	Reserved

Receiver of signal and signal features required by the receiver:

EMS, ESC, SCC, CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Tcu_Alive	**Alive Counter**	**TCU2**	**0440H**	**12**	**2**

Signal definition:

This signal indicates the alive counter of TCU2 message

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0 ... 3 = 00H … 03H

Conversion: (PHYS) = (HEX)
0 … 3: after the counter is 3 it starts again at 0

Receiver of signal and signal features required by the receiver:

ESC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Tcu_ChkSum	**Checksum**	**TCU2**	**0440H**	**14**	**2**

Signal definition:

This signal indicates Checksum of the signals CUR_GR and CF_Tcu_Alive in TCU2 Message.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: -

Conversion: (PH) = ((Bits 8 and 9) + (Bits 10 and 11) + (Bits 12 and 13)) & 0x03
Add two bit integers

Receiver of signal and signal features required by the receiver:

ESC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
VS_TCU	**Vehicle speed calculated by TCU**	**TCU2**	**0440H**	**16**	**8**

Signal definition:

The vehicle speed calculated by TCU is transferred.

If a vehicle has no vehicle speed sensor, no wheel speed sensor and no ABS(TCS/ESC) then it is impossible for an EMS to calculate veficle speed. In this case a TCU should calculate vehicle speed and send to other ECUs.

The calculation can be done with output speed of gearbox, final gear ratio and actual radius of a tire.

In case of failure the value FFH is used as error identifier.

Circuit schematic for signal conditioning: none

Functional requirements for wheel velocities:

Initial value: 00H

Error identifier: FFH

Physical range: 0 ... 254 km/h = 00H.. FEH

Conversion: (PH) = 1 * (HEX) [km/h]

Receiver of signal and signal features required by the receiver:
EMS, CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
FAN_CTRL_TCU	**Cooling fan control request**	**TCU2**	**0440H**	**24**	**2**

Signal definition:

This signal indicates that a TCU requests cooling fan control of EMS to prevent overheating of ATF oil temperature. If FAN_CTRL_TCU signal is set to between 01H~03H during cooling fan control of EMS to prevent overheating of water temperature by its own control logic then higher speed control command should have higher priority.

Example:

TCU request	Current control state by EMS	Result
No request	Low speed control	Low speed control
Low Speed	Mid-Speed Control	Mid-Speed Control
High Speed	Mid-Speed Control	High-Speed Control

There is no specific phase relationship between the output and any other signal.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0..3 = 00H..03H

Conversion:

FAN_CTRL	Function
00H	Fan control is not needed
01H	Low-Speed Control
02H	Mid-Speed Control
03H	High-Speed Control

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
BRAKE_ACT_TCU	**Indication of brake switch on/off by TCU**	**TCU2**	**0440H**	**26**	**2**

Signal definition:

This signal indicates that a brake switch is activated or not. When the brake switch is activated(pressed) its value is 02H otherwise its value is 01H.
If the TMS does not support this signal the value is 00H.

Functional requirements:

Initial value: 01H

Error identifier: 03H

Physical range: 00H .. 03H

Conversion:

BRAKE_ACT_TCU	Function
00H (00b)	TMS does not support this function.
01H (01b)	Brake switch is not pressed (OFF)
02H (10b)	Brake switch is pressed (ON),
03H (11b)	Brake switch failure.

Receiver of signal and signal features required by the receiver:

EMS

Note:

This parameter is defined for the Theta ENG+ Non ETC type vehicle (SIEMENS PCU).

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
FUEL_CUT_TCU	**Fuel cut request during garage shift**	**TCU2**	**0440H**	**28**	**1**

Signal definition:

This signal indicates that a TCU requests engine fuel cut control during garage shift (N-D shift). When this signal set to one, an EMS should control fuel cut in all cylinders to shorten time lag.

On Condition : During grage shift, if engine RPM increases and is higher than specific RPM (TCU internal calibrated RPM)
Off Condition : If engine RPM decreses and is lower than specific RPM.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H .. 01H

Conversion:

FUEL_CUT_TCU	Function
00H	No request
01H	Fuel cut request from TCU

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
INH_FUEL_CUT	**Inhibition of engine fuel cut off**	**TCU2**	**0440H**	**29**	**1**

Signal definition:

During coast down shifting, EMS may cut off fuel injection and as a result, a driver can feel bad shift feeling. In this case, to enhance shift quality, TCU needs inhibition of fuel cut off control.
This signal indicates inhibition of engine fuel cut off control.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H .. 01H

Conversion:

INH_FUEL_CUT	Function
00H	No request
01H	Fuel cut inhibition request from TCU

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
IDLE_UP_TCU	**TCU requests engine idle RPM up**	**TCU2**	**0440H**	**30**	**1**

Signal definition:

When ATF(Automatic Transmission Fluid) rises in high temperauture, the TCU requests engine idle RPM up via the signal IDLE_UP_TCU to the EMS for reduction of gearshift time form Neutral to Reverse.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H .. 01H

Conversion:

IDLE_UP_TCU	Function
00H	No IDLE UP request
01H	IDLE UP request

Receiver of signal and signal features required by the receiver:

EMS

Note:

THIS SIGNAL IS FOR “LAMBDA ENGINE” SYSTEM ONLY.

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
N_INC_TCU	**Engine speed increasing requirement flag**	**TCU2**	**0440H**	**31**	**1**

Signal definition:

This signal is a target engine speed requirement start flag signal by TCU,
which is sent to ECU. It is synchronized to the signal engine speed increasing target speed value

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H .. 01H

Conversion:

N_INC_TCU	Function
00H	No request
01H	Engine speed increase is requested

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
SPK_RTD_TCU	**Requested spark retard angle from TCU**	**TCU2**	**0440H**	**32**	**8**

Signal definition:

The TCU requests a spark angle retard via the signal SPK_RTD_TCU to the EMS for torque reduction during the gear engage condition.

Functional requirements:

If there is no intervention, the passive value is transferred.

Initial value: FFH

Physical range: SPK_RTD_TCU: -15 ° ... 0 ° = 17H .. 3FH (Retard)
0.375 ° . 15 ° = 40H .. 67H (Advance)

Conversion: (PH) = ((HEX) – 3FH) * 0.375 [°] (Advance)
(PH) = (3FH - (HEX)) * (-0.375) [°] (Retard)

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
N_TC_RAW	**Unfiltered Torque converter turbine speed**	**TCU2**	**0440H**	**40**	**16**

Signal definition:

N_TC_RAW represents the unfiltered speed of the torque converter turbine of the gearbox at gearbox-side.

Circuit schematic for signal conditioning: none

Functional requirements:

Initial value: 0000H

Error identifier: FFFFH

Physical range: 0 .. 16383.5 rpm = 0000H .. FFFEH

Conversion: (PH) = 0.25 * (HEX) [rpm]

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
VS_TCU_DECIMAL	**The value below decimal point of vehicle speed**	**TCU2**	**0440H**	**56**	**8**

Signal definition:

The signal VS_TCU_DECIAMAL means the value which is below decimal point of the vehicle speed.
For instance, if a vehicle speed is 13.75Km/h, VS_TCU means 13Km/h and VS_TCU_DECIMAL means 0.75Km/h.

Functional requirements:

Initial value: 00H

Error identifier: 00H

Physical range: 0 … 0.9921875 = 00H .. 7FH

Conversion: (PH) = (HEX) / 128 [km/h]

Example) VS_TCU = 13, VS_TCU_DECIAMAL = 96
Vehicle speed = VS_TCU + (VS_TCU_DECIMAL / 128)
= 13 + (96 / 128) = 13.75 [Km/h]

Receiver of signal and signal features required by the receiver:
EMS, CLU

Note:

6.2.18 TCU3 Message

Message: TCU3	Identifier : 0370H

@@

Signal Label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
N_TGT_LUP	Target engine speed used in lock-up module	0	8	FFH	-
SLOPE_TCU	Calculated road gradient	8	6	20H	-
CF_Tcu_InhCda	Inhibition of CDA Transition	14	1	00H	-
Free	Free	15	1	00H	-
CF_Tcu_BkeOnReq	Brake ON Request	16	2	00H	-
CF_Tcu_NCStat	The status of NC	18	2	00H	-
CF_Tcu_TarGr	Target of gear change	20	4	00H	-
CF_Tcu_ShfPatt	ID of current shift pattern	24	4	00H	-
Free	Free	28	4	00H	-
CF_Tcu_TqGrdLim	Torque gradient limitation	32	8	00	-
Free	Free	40	24	00H	-

Memory layout:

<table>
<tr><td colspan="4">Free</td><td>56</td></tr>
<tr><td colspan="4">Free</td><td>48</td></tr>
<tr><td colspan="4">Free</td><td>40</td></tr>
<tr><td colspan="4">CF_Tcu_TqGrdLim</td><td>32</td></tr>
<tr><td colspan="2">Free</td><td colspan="2">CF_Tcu_ShfPatt</td><td>24</td></tr>
<tr><td colspan="2">CF_Tcu_TarGr</td><td>CF_Tcu_NCStat</td><td>CF_Tcu_BkeOnReq</td><td>16</td></tr>
<tr><td>Free</td><td>CF_Tcu_InhCda</td><td colspan="2">SLOPE_TCU</td><td>8</td></tr>
<tr><td colspan="4">N_TGT_LUP</td><td>0</td></tr>
</table>

Transmission parameters - Conditions

Message	TCU3
System	TCU
Output period	10ms
Output period tolerance	-
Latency	max 5 ms
Remote operation	no
Message Time out	500ms
Message Validity	IGN1
Phase relationship to another message	no

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
N_TGT_LUP	**Target engine speed used in lock-up module**	**TCU3**	**0370H**	**0**	**8**

Signal definition:

This signal is a target engine speed requested by TCU, which is sent to ECU.
It is intended for OFF-SLIP to be more successful in triggering fuel cut-off under more various driving conditions.

Functional requirements:

Initial value: FFH

Error identifier: -

Physical range: 500 ... 3040 [rpm] = 00H ... FEH

Conversion: (PH) = 10 * (HEX) + 500 [rpm]

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
SLOPE_TCU	**Calculated road gradient**	**TCU3**	**0370H**	**8**	**6**

Signal definition:

This signal is used to avoid busy shifting during uphill driving.
It is calculated using engine torque, turbine torque and gearbox torque so on.
It has some restrictions like the following sentences
- No slope calculation during shifting, braking, 1st gear, or at low oil temperature (Under 10 degree).
- The slope calculation is inaccurate at low vehicle speed (under 30 KPH).
- Slope is calculated according to (CVW + 180Kg). It means that if the vehicle weight increases more than it, then the calculated slope value increases.

If calculated road gradient is less than -16%, SLOPE_TCU should be set to 00h, and if calculated road gradient is more than 15.5%, SLOPE_TCU should be set to 3Fh.

Functional requirements:

Initial value: 20H

Error identifier: -

Physical range: -16 ... 15.5[%] = 00H ... 3FH

Conversion: (PH) = 0.5 * (HEX) – 16 [%]

Receiver of signal and signal features required by the receiver:

EMS, CLU, CUbiS

Note:

@@

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Tcu_InhCda	**Inhibition of CDA Transition**	**TCU3**	**0370H**	**14**	**1**

Signal definition:

TCU requests ECU to prohibit the CDA transition during gear shifting or lock-up clutch operation in the automatic transmission in order to prevent a shock on the vehicle. Without gear shifting and lock-up clutch operation, CDA transition can be performed.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H .. 01H

Conversion:

CF_Tcu_InhCda	Function
00H	CDA transition is available
01H	TCU prohibits CDA transition

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Tcu_BkeOnReq	**Brake ON Request**	**TCU3**	**0370H**	**16**	**2**

Signal definition:

The TCU request the ESC to activate the Brake
The ESC holds the Brake ON during the TCU's Brake ON Request.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H .. 03H

Conversion:

CF_Tcu_BkeOnReq	Function
00H	No request
01H	Brake On Request
02H	Reserved
03H	Reserved

Receiver of signal and signal features required by the receiver:

ESC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Tcu_NCStat	**The status of NC**	**TCU3**	**0370H**	**18**	**2**

Signal definition:

This signal indicates the status of Neutral Control

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H .. 03H

Conversion:

CF_Tcu_NCStat	Function
00H	No NC
01H	NC Entry
02H	NC Applied
03H	NC Exit

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Tcu_TarGr	**Target of gear change**	**TCU3**	**0370H**	**20**	**4**

Signal definition:

CF_Tcu_TarGr informs about the speed, which is currently engaged in the gearbox, or, in case of a gear change (SWI_GS), which speed is reached.
Note: Gear changes covering more than one speed are also possible.
In the P and N positions, the frictional connection is interrupted hydraulically.
Depending on the type of error, the 3rd or 4th (forward) speed, and the R (reverse) speed are engaged in the limp home program.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0..15 = 0H .. FH

Conversion:

CF_Tcu_TarGr	Function
0H	if N or P are detected (no frictional connection)
1H	1st speed
2H	2nd speed
3H	3rd speed
4H	4th speed
5H	5th speed
6H	6th speed
7H	7th speed
8H	8th speed
9H~DH	Reserved
EH	Reverse speed
FH	Reserved

Receiver of signal and signal features required by the receiver:

ESC, SCC, CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Tcu_ShfPatt	**ID of current shift pattern**	**TCU3**	**0370H**	**24**	**4**

Signal definition:

It is an ID of current shift pattern which is being used by TCU.
The ID is assigned for each TCU.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0..15 = 0H .. FH
##
Conversion:

CF_Tcu_ShfPatt	Function
00H	Normal (ECO)
01H	Uphill 1 (Optional)
02H	Uphill 2 (Optional)
03H	Reserved
04H	Downhill 1 (Optional)
05H	Cruise (Optional)
06H	Cruise_Uphill 1 (Optional)
07H	Cruise_Uphill 2 (Optional)
08H~0EH	Reserved
0FH	None of the above

Receiver of signal and signal features required by the receiver:

CLU, CUbiS

Note:

@@

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Tcu_Tq GrdLim	**Torque gradient limitation**	**TCU3**	**0370H**	**32**	**8**

Signal definition:

TCU requests EMS to perform the engine torque gradient limitation control with a rate of Nm per second(Nm/sec).

Downshift : The engine torque gradient limitation for downshift will be a function of pedal and shift-time.
Upshift : The engine torque gradient limitation for upshift will be a function of shift-time.

Functional requirements:

Initial value: 00H

Error identifier: ~~FFH (No torque gradient limitation)~~ -

Physical range: 0 ... 2540 [Nm/s] = 00H ... FEH
FFH (No torque gradient limitation)

Conversion: (PH) = 10 * (HEX) [Nm/s]

Receiver of signal and signal features required by the receiver:

EMS

Note:

6.2.19 4WD1 Message

Message: 4WD1	Identifier: 0428H

Signal label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
4WD_TYPE	Information of 4WD type	0	2	00H	-
4WD_SUPPORT	Information of supporting signals	2	2	00H	-
Free	Free	4	4	00H	-
4WD_ERR	4WD ECU faults code	8	8	00H	-
CLU_DUTY	4WD clutch duty cycle	16	8	00H	FFH
R_TIRE	Dynamic radius of a tire	24	8	00H	-
4WD_SW	Software version	32	8	00H	-
2H_ACT	“2H“ mode indication	40	1	00H	-
4H_ACT	“4H“ mode indication	41	1	00H	-
LOW_ACT	“LOW“ mode indication	42	1	00H	-
AUTO_ACT	“AUTO“ mode indication	43	1	00H	-
LOCK_ACT	“LOCK“ mode indication	44	1	00H	-
4WD_TQC_CUR	4WD current cardan shaft torque	48	16	0000H	FFFFH

Memory layout:

4WD_TQC_CUR (high)						56
4WD_TQC_CUR (low)						48
Free	LOCK_ACT	AUTO_ACT	LOW_ACT	4H_ACT	2H_ACT	40
4WD_SW						32
R_TIRE						24
CLU_DUTY						16
4WD_ERR						8
Free		4WD_SUPPORT		4WD_TYPE		0

Transmission parameters - Conditions

System	4WD
Output period	20 ms
Output period tolerance	± 2 ms
Latency	max. 5 ms
Transmit condition	Power supply via EMS primary relay
Remote operation	no
Message Time out	500ms
Message Validity	IGN1
Phase relationship to another message	no

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
4WD_TYPE	**Information of 4WD type**	**4WD1**	**0428H**	**0**	**2**

Signal definition:

There are 3 types of 4WD controller according to the powertain configuration. This signal indicates that which kind of 4WD controller is installed in a vehicle.

Electronic 4WD(FF type powertrain) = Controlling a disc clutch between front and rear axle by 4WD controller
Electronic 4WD(FR type powertrain) = Controlling a high low range shift and a disc clutch between rear and front axle by 4WD controller.
Electric shift 4WD(FR type powertrain) = Controlling a high low range shift and a claw coupling between rear and front axle by 4WD controller.

Functional requirements

Initial value : 00H

Error Identifier : --

Physical range : 00H .. 03H

Conversion :

4WD_TYPE	Function
00H	Reserved
01H	Electronic 4WD (FF)
02H	Electronic 4WD (FR)
03H	Electric shift 4WD (FR)

Receiver of signal and signal features required by the receiver:

ESC, ACU

Note:

* FF = Front engine and Front wheel driving
* FR = Front engine and Rear wheel driving

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
4WD_SUPPORT	**Information of supporting signals**	**4WD1**	**0428H**	**2**	**2**

Signal definition:
4WD controller provides the information whether shaft torque signal and/or steering angle sensor value (analog type sensor) can be supported or not.

Ex) If both the maximum cardan shaft torque signal and steering angle value are supported then 4WD_SUPPORT shall be set to “11h”. In other hand, if only the maximum cardan shaft torque signal is supported but steering angle value is not supported then this signal shall be set to “01h”

Functional requirements

Initial value : 00H

Error Identifier : -

Physical range : 00H .. 03H

Conversion :

4WD_SUPPORT		Function
X	0	Not support of 4WD MAX. cardan shaft torque
X	1	Support of 4WD MAX. cardan shaft torque
0	X	Not support of steering angle value
1	X	Support of steering angle value

Receiver of signal and signal features required by the receiver:

ABS/ESC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
4WD_ERR	**4WD ECU faults code**	**4WD1**	**0428H**	**8**	**8**

Signal definition:

4WD controller provides all information of the detected error for 4WD controller, steering angle sensor and speed sensor via CAN bus except for hub solenoid faults in part time system(EST system) and various CAN message faults on vehicle level.

Functional requirements:

Bit 0(MOD_ERR) : Set if internal 4WD ECU failure is detected.

Bit 1 (Ster_Err) : Set if steering angle sensor including ster_1, ster_2,ster_c is detected.

Bit 2 (Shift Err) : Set if shift motor or encoder failure is detected

Bit 3 (FRSS_Err) : Set if front right speed sensor or front propeller shaft speed sensor failure is detected

Bit 4 (FLSS_Err) : Set if front left speed sensor failure is detected.

Bit 5 (RRSS_Err): Set if rear right speed sensor or rear propeller shaft speed sensor failure is detected

Bit 6 (RLSS_Err) : Set if rear left speed sensor failure is detected.

Bit 7 (CLU_Err) : Set if 4WD magnetic clutch failure is detected

Receiver of signal and signal features required by the receiver:

CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CLU_DUTY	**4WD clutch duty cycle**	**4WD1**	**0428H**	**16**	**8**

Signal definition:

4WD controller provides an information of electromagnetic clutch duty cycle when the controller is active.

Functional requirements:

Initial value: 00H

Error identifier: FFH

Physical range: 00H .. 64H

Conversion CLU_DUTY(PHYS) =1*(HEX) [%]

Receiver of signal and signal features required by the receiver :

ESC

Note:

Part time 4WD system does not support this information via CAN

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
R_TIRE	**Dynamic radius of a tire**	**4WD1**	**0428H**	**24**	**8**

Signal definition:

4WD controller provides information on dynamic radius of its tire for calculating vehicle speed.

Functional requirements

Initial value: 00H

Error identifier: --

Physical range: 200 ... 455 mm = 00H.. FFH

Conversion: (PH) = 1 * (HEX) + 200 [mm]

Receiver of signal and signal features required by the receiver :

ABS/ESC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
4WD_SW	**Software version**	**4WD1**	**0428H**	**32**	**8**

Signal definition:

4WD controller provides an information of software version.

Functional requirements:

Bits 0(SWR0), Bit 1(SWR1), Bit 2(SWR2), and Bit 3(SWR3) : Contain a Binary Coded Decimal (BCD) which represents the software version right of the decimal point.

Bits 4(SWL0), Bit 5(SWL1), Bit 6(SWL2), and Bit 7(SWL3) : Contain a BCD which represents the software revision left of the decimal point.

Example:
Software Version 4.12 would be represented by

SWL 7	SWL 6	SWL 5	SWL 4	SWR 3	SWR 2	SWR 1	SWR 0
0	1	0	0	1	1	0	0

Receiver of signal and signal features required by the receiver :

ESC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
2H_ACT	**“2H“ mode indication**	**4WD1**	**0428H**	**40**	**1**
4H_ACT	**“4H“ mode indication**	**4WD1**	**0428H**	**41**	**1**
LOW_ACT	**“LOW“ mode indication**	**4WD1**	**0428H**	**42**	**1**
AUTO_ACT	**“AUTO“ mode indication**	**4WD1**	**0428H**	**43**	**1**
LOCK_ACT	**“LOCK“ mode indication**	**4WD1**	**0428H**	**44**	**1**

Signal definition:

4WD controller provides various information on its operational modes of “2H”, “4H”, “LOW”, “AUTO” and “LOCK”. Each signal indicates activation of its mode and if a mode is activated this signal is set to “1”.

Functional requirements:

Initial value : 00H

Error identifier :

Physical range : 0….1H = 00H .. 01H

Conversion:

XX_ACT	Function
0	XX mode is inactive
1	XX mode is activated

Receiver of signal and signal features required by the receiver :

ABS/ESC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
4WD_TQC_CUR	**4WD current cardan shaft torque**	**4WD1**	**0428H**	**48**	**16**

Signal definition:

4WD controller provides an information of the current cardan shaft torque being transferred.
However, part time application does not support this signal since the clutch is only used for axle synchronization

Functional requirements:

Initial value: 0000H

Error identifier: FFFFH

Physical range: 0 Nm ... 64255 Nm = 0000H ... FAFFH

Conversion: (PH) = 1 * (HEX) [Nm]

Receiver of signal and signal features required by the receiver :
ABS/ESC

Note:

6.2.20 4WD2 Message

Message: 4WD2	Identifier: 0429H

Signal label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
Ster_Pos	Steering wheel position	0	16	0000H	FFFFH
FRSS	Front right speed sensor	16	8	00H	FFH
FLSS	Front left speed sensor	24	8	00H	FFH
RRSS	Rear right speed sensor	32	8	00H	FFH
RLSS	Rear left speed sensor	40	8	00H	FFH
PROPEL_F_4WD	Front propeller shaft speed	48	8	00H	FFH
PROPEL_R_4WD	Rear propeller shaft speed	56	8	00H	FFH

Memory layout:

PROPEL_R_4WD	56
PROPEL_F_4WD	48
RLSS	40
RRSS	32
FLSS	24
FRSS	16
Ster_pos	8
Ster_pos	0

Transmission parameters - Conditions

System	4WD
Output period	20 ms
Output period tolerance	± 2 ms
Latency	max. 5 ms
Transmit condition	Power supply via EMS primary relay
Remote operation	no
Message Time out	500ms
Message Validity	IGN1
Phase relationship to another message	no

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
Ster_Pos	**Steering wheel position**	**4WD2**	**0429H**	**0**	**16**

Signal definition:
The angle of the steering wheel.
When the vehicle is moving straight the angle is zero.
When the wheel is turned to the left the angle is positive.
When the wheel is turned to the right the angle is negative.

4WD controller provides an information of steering wheel position.
This byte contains the present position of the steering wheel.

Functional requirements:

Initial value : 0000H

Error identifier : FFFFH

Physical range : -600 to +600 degree = 0 to 04B0H
Negative rotation is the two's compliment of the positive value

Conversion : (PH)=1*(HEX) – 600 [degree]

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
FRSS	**Wheel velocity, front, right-hand**	**4WD2**	**0429H**	**16**	**8**
FLSS	**Wheel velocity, front, left-hand**	**4WD2**	**0429H**	**24**	**8**
RRSS	**Wheel velocity, rear, right-hand**	**4WD2**	**0429H**	**32**	**8**
RLSS	**Wheel velocity, rear, left-hand**	**4WD2**	**0429H**	**40**	**8**

Signal definition:

The wheel velocities of the vehicle are transferred.

In case of failure of one wheel speed sensor, the value FFH of the wheel concerned is used as error identifier.

There is no specific phase relationship between the output and any other signal.

Circuit schematic for signal conditioning: none

Functional requirements for wheel velocities:

Initial value: 00H

Error identifier: FFH

Physical range: 0 ... 254 km/h = 00H.. FEH

Conversion: (PH) = 1 * (HEX) [km/h]

Note :

These signals are not available in a part time 4WD system and 4WD system which use propeller shaft speed,

LABEL	Designation	Message	Identifier	Bit add.	Bit lnd.
PROPEL_F_4WD	**Front propeller shaft speed**	**4WD2**	**0429H**	**48**	**8**
PROPEL_R_4WD	**Rear propeller shaft speed**	**4WD2**	**0429H**	**56**	**8**

Signal definition:

In a 4WD system which is controlled by the propeller shaft speed (not wheel speed), these signals provide mean speed of front and rear wheels respectively.

Functional requirements for wheel velocities:

Initial value: 00H

Error identifier: FFH

Physical range: 0 …2540 Hz = 00H..FEH

Conversion: (PH) = 10 * (HEX) [Hz]

Receiver of signal and signal features required by the receiver :

TBD

6.2.21 LPI1 Message

Message: LPI1	Identifier: 0271H

Signal label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
FUP_LPG_MMV	LPG Gas Fuel Pressure	0	8	00H	-
LV_FUEL_TYPE_BOX	Active fuel type in LPI interface box	8	1	00H	-
LV_BFS_IN_PROGRESS	Fuel switching is in progress	9	1	00H	-
LV_GAS_OK	Gas system state	10	1	00H	-
LV_FUP_ENA_THD	Fuel pressure state	11	1	00H	-
LPI_OBD	OBDII status of LPI interface box	12	4	00H	-
ERR_GAS	Error in LPI interface box	16	8	00H	-
FAC_TI_GAS_COR	Injection time correction factor for LPG	24	16	8000H	-
FTL_AFU	Fuel tank level of alternative fuel	40	8	00H	-
BFS_CYL	Cylinder number of active cylinder at fuel switching	48	8	00H	-
LV_PRE_CDN_LEAK	Condition for injector leak monitoring	56	1	00H	-
LV_CONF_INJECTION_DELAY	Configuration for injection delay	57	1	00H	-
LV_LPG_SW_DRIVER_REQ	LPG Switch on/off state	58	1	00H	-
Reserved	Reserved for flag bits	59	5	00H	-

Memory layout:

Reserved		LV_LPG_SW_DRIVER_REQ	LV_CONF_INJECTION_DELAY	LV_PRE_CDN_LEAK	56
BFS_CYL					48
FTL_AFU					40
FAC_TI_GAS_COR (high)					32
FAC_TI_GAS_COR (low)					24
ERR_GAS					16
LPI_OBD	LV_FUP_ENA_THD	LV_GAS_OK	LV_BFS_IN_PROGRESS	LV_FUEL_TYPE_BOX	8
FUP_LPG_MMV					0

Transmission parameters - Conditions

Message	LPI1
System	LPI Interface Box
Output period	10 ms
Output period tolerance	± 6 ms
Latency	max. 5 ms
Transmit condition	Power supply via EMS primary relay
Remote operation	no
Message Time out	500ms
Message Validity	IGN1
Phase relationship to another message	no

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
FUP_LPG_MMV	**LPG Gas Fuel Pressure**	**LPI1**	**0271H**	**0**	**8**

Signal definition:

This signal indicates LPG GAS Fuel Pressure which will be used for injection , OBD diagnosis, lambda control, idle speed control, etc.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H … FFH = 0 … 32640 [hPa]

Conversion: (PH) = 128 * (HEX) [hPa]

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
LV_FUEL_TYPE_BOX	**Active Fuel type in LPI interface box**	**LPI1**	**0271H**	**8**	**1**

Signal definition:

LV_FUEL_TYPE_BOX indicates the active fuel in LPI interface box. This flag is used for fuel swtiching (bi – fuel).

Circuit schematic for signal conditioning: none

Functional requirements:

Initial value: 00H

Error identifier: -

Conversion:

LV_FUEL_TYPE_BOX	FUNCTION
0	Gasoline
1	Gas

Receiver of signal and signal features required by the receiver:
EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
LV_BFS_IN_PROGRESS	**Fuel switching is in progress**	**LPI1**	**0271H**	**9**	**1**

Signal definition:

LV_BFS_IN_PROGRESS indicates that fuel switching is in progress in LPI interface box. This flag is used for fuel swtiching (bi – fuel).

Circuit schematic for signal conditioning: none

Functional requirements:

Initial value: 00H

Error identifier: -

Conversion:

LV_BFS_IN_PROGRESS	FUNCTION
0	No progress
1	Progress

Receiver of signal and signal features required by the receiver:
EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
LV_GAS_OK	**Gas system state**	**LPI1**	**0271H**	**10**	**1**

Signal definition:

LV_GAS_OK indicates that the gas system of LPI interface box is OK.

Circuit schematic for signal conditioning: none

Functional requirements:

Initial value: 00H

Error identifier: -

Conversion:

LV_GAS_OK	FUNCTION
0	Gas system is not OK
1	Gas system is OK

Receiver of signal and signal features required by the receiver:
EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
LV_FUP_ENA_THD	**Fuel pressure state**	**LPI1**	**0271H**	**11**	**1**

Signal definition:

LV_FUP_ENA_THD indicates that the pressure on fuel rail is enoygh high to start engine.

Circuit schematic for signal conditioning: none

Functional requirements:

Initial value: 00H

Error identifier: -

Conversion:

LV_FUP_ENA_THD	FUNCTION
0	The pressure is too low to start engine.
1	The pressure is enough high to start engine.

Receiver of signal and signal features required by the receiver:
EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
LPI_OBD	**OBDII status of LPI interface box**	**LPI1**	**0271H**	**12**	**4**

Signal definition:

The signal LPI_OBD is used to inform the OBD master (gasoline ECU) in case that a OBD relevant fault is detected. According to the OBD regulations the LPI interface box should request MIL on and freeze frame storage. If a freeze frame request by the LPI interface box has not been acknowledged (OBD_FRF_ACK) within 2 seconds, this request has to be canceled.

=> OBD requirements.

There is no specific phase relationship between the output and any other signal.

Functional requirements:

Initial value: 00H

Error identifier: see table below

Physical range: 0..0FH

Conversion:

Bit 3	Bit 2	Bit 1	Bit 0
MIL off & fault code storage	*MIL on & fault code storage*	Freeze frame request	Readiness info

Receiver of signal and signal features required by the receiver:

EMS : OBD status of LPI interface box

Note:

The exact meaning of this signal and conditions that this signal is used have to be defined by the LPI interface box supplier (in accordance with the OBD regulations).

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ERR_GAS	**Errors in the LPI interface box**	**LPI1**	**0271H**	**16**	**8**

Signal definition:

ERR_GAS indicates errors in LPI interface box.

There is no specific phase relationship between the output and any other signal.

Representation of the numerical value:

ERR_GAS							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
OK with restrictions (LV_State_REST)	OK ready to operate (LV_STATE_OK)	Gas tank almost empty	Error auxiliary devices	Error gas system	Error gas injection path	Error gasoline injection path	Error emergency stop

Circuit schematic for signal conditioning: none

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: -

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
FAC_TI_GAS_COR	**Injection time correction factor for LPG**	**LPI1**	**0271H**	**24**	**16**

Signal definition:

FAC_TI_GAS_COR indicates the gas correction and it is applied ti caluclation in gasoline ECU.

There is no specific phase relationship between the output and any other signal.

Functional requirements:

Initial value: 8000H

Physical range: 0 ... 1.999 = 0000H … FFFFH

Conversion: (PH) = 3.05E-5 * (HEX)

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
FTL_AFU	**Fuel tank level of alternative fuel**	**LPI1**	**0271H**	**40**	**8**

Signal definition:

FTL_AFU represents fuel tank level of LPG in LPI interface box.

There is no specific phase relationship between the output and any other signal.

Circuit schematic for signal conditioning: none

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0 … 99.96 % = 00H .. FFH

Conversion: (PH) = 0.392 * (HEX) [%]

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
BFS_CYL	**Cylinder number of active cylinder at fuel switching**	**LPI1**	**0271H**	**48**	**8**

Signal definition:

BFS_CYL indicates cylinder number that will change fuel at fuel switching request being progressed in LPI interface box. It is used for fuel swtiching (bi – fuel).

There is no specific phase relationship between the output and any other signal.

Circuit schematic for signal conditioning: none

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0 … 6 [Cyl Nr.] = 00H .. 06H

Conversion: (PH) = (HEX) [Cyl Nr.]

(BFS_CYL = 0 means finish of fuel switching)

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
LV_PRE_CDN_LEAK	**Condition for injector leak monitoring**	**LPI1**	**0271H**	**56**	**1**

Signal definition:

LV_PRE_CDN_LEAK indicates the leak monitoring conditon activation in Lpi IB. This flag is used for leak monitoring function in EMS ECU.

Circuit schematic for signal conditioning: none

Functional requirements:

Initialization value: 00H

Error identifier: -

Conversion:

LV_PRE_CDN_LEAK	FUNCTION
0	Not Active
1	Active

Receiver of signal and signal features required by the receiver:
EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
LV_CONF_INJECTION_DELAY	**Configuration for injection delay**	**LPI1**	**0271H**	**57**	**1**

Signal definition:

LV_CONF_INJECTION_DELAY indicates the variant coding for leak monitoring activation in Lpi IB. This flag is used for leak monitoring function in EMS ECU.

Circuit schematic for signal conditioning: none

Functional requirements:

Initialization value: 00H

Error identifier: -

Conversion:

LV_CONF_INJECTION_DELAY	FUNCTION
0	Not Active
1	Active

Receiver of signal and signal features required by the receiver:

EMS

Note:

If LV_CONF_INJECTION_DELAY = 0, leak monitoring function in EMS does not work.

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
LV_LPG_SW_DRIVER_REQ	**LPG Switch on/off state**	**LPI1**	**0271H**	**58**	**1**

Signal definition:

This is a direct input from LPG Switch in order to inhibit unnecessary DTC occurrence by excessive adaptation of fuel compensation largely due to system pressure drop using LPG button status transmitted from IFB ECU to EMS ECU via CAN line

Functional requirements:

Initialization value: 00H

Error identifier: -

Conversion:

LV_LPG_SW_DRIVER_REQ	FUNCTION
0	LPG Switch Not Pressed
1	LPG Switch Pressed

Receiver of signal and signal features required by the receiver:

EMS

Note:

6.2.22 SAS1 Message

Message: SAS1	Identifier: 02B0H

Signal label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
SAS_Angle	Steering wheel angle	0	16	Current	7FFFH
SAS_Speed	Steering wheel rotation speed	16	8	00H	FFH
SAS_Stat	Internal status	24	8	07H	-
MsgCount	Number of the message	32	4	00H	-
CheckSum	Value to check the message bytes	36	4	00H	-

Memory layout:

CheckSum				MsgCount				32
SF5	SF4	SF3	SF2	SF1	SAS_Trim	SAS_CAL	SAS_OK	24
SAS_Speed								16
SAS_Angle (High byte)								8
SAS_Angle (Low byte)								0

Transmission parameters - Conditions

System	SAS
Output period	10 ms
Output period tolerance	± 1 ms
Latency	max. 5 ms
Transmit condition	Power supply via EMS primary relay
Remote operation	no
Message Time out	100ms
Message Validity	IGN1
Phase relationship to another message	no

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
SAS_Angle	**Steering wheel angle**	**SAS1**	**02B0H**	**0**	**16**

Signal Definition :

Information regarding the steering wheel angle

Functional Requirements:

Initial value : current angle

Error Identifier : 7FFFH

Physical range : 0000H ..... FFFFH

Conversion : (PH) = (HEX) × 0.1 (for 0 < HEX ≤ 7FFFH) or
= (HEX – 65536) × 0.1 (for HEX > 7FFFH) [Deg]

Receiver of signal and signal features required by the receiver:
%%
ESC, SCC, ACU, AFLS, SPAS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
SAS_Speed	**Steering wheel rotation speed**	**SAS1**	**02B0H**	**16**	**8**

Signal Definition :

Information regarding the steering wheel rotation speed

Functional Requirements:

Initial value : 00H

Error Identifier : FFH

Physical range : 00H ..... FEH

Conversion : (PH) = (HEX) × 4 (for 0 < HEX ≤ FEH)

Receiver of signal and signal features required by the receiver:
%%
ESC, SCC, SPAS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
SAS_Stat	**SAS internal status flag**	**SAS1**	**02B0H**	**24**	**8**

Signal Definition :

Information regarding the steering angle sensor's internal state
If SAS_Angle value is O.K., SAS_OK flag is set and otherwise SAS_OK flag is cleared.
If steering angle sensor has been calibrated, SAS_CAL flag is set and otherwise cleared.
SF1 – SF5 : for internal use only

Functional Requirements:

Initial value: 07H

Error Identifier : -

Physical range : -

Conversion :

SAS_OK	SAS_CAL	SAS_Angle	SAS_Speed
1	1	value	value
1	0	7FFFh	value
0	1	7FFFh	FFh
0	0	7FFFh	FFh

※ If SAS is trimmed, SAS_Trim flag = 1.
If SAS is not trimmed (in this case SAS_OK=0 and SAS_CAL=0), SAS_Trim flag=0.

Receiver of signal and signal features required by the receiver:
%%
ESC, SCC, SPAS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
MsgCount	**Number of the message**	**SAS1**	**02B0H**	**32**	**4**

Signal Definition :

Information for the ECU to know if messages are lost between the receptions of two messages.

Receiver of signal and signal features required by the receiver:
%%
ESC, SCC, SPAS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CheckSum	**Value to check the message bytes**	**SAS1**	**02B0H**	**36**	**4**

Signal Definition :

Checksum of all bytes of the CAN matrix.

Functional Requirements:

Rule to build the checksum :

Temp_result = [SAS_Angle(Low byte)] **XOR** [SAS_Angle(High byte)]
XOR [SAS_Speed] **XOR** [SAS_Stat]

Checksum = [Temp_result (High 4bit)] **XOR** [Temp_result(Low 4bit)] **XOR** [MsgCount]

Receiver of signal and signal features required by the receiver:
%%
ESC, SCC, SPAS

Note:

6.2.23 CAL_SAS Message

Message: CAL_SAS	Identifier: 07C0H

Signal label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
CCW	Command code word	0	4	-	
SAS_CID	SAS-CAN transmit identifier	4	11	02B0h	

Memory layout:

Free	SAS_CID	8
SAS_CID	CCW	0

Transmission parameters - Conditions

System	ESC or ECS (in the case of Non-ESC)
Output period	at SAS calibration (Event Driven)
Output period tolerance	-
Latency	-
Transmit condition	-
Remote operation	no
Message Time out	N.A.
Message Validity	IGN1
Phase relationship to another message	no

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CCW	**Command code word**	**CAL_SAS**	**07C0H**	**0**	**4**

Signal Definition :

Command information regarding the steering angle sensor's calibration/de-calibration
If the SAS_CAL(SAS1) flag is not set (=0) the calibration message will be accepted without preceding de-calibration procedure.
If the SAS_CAL flag is set (=1) it is necessary to send the de-calibration message before calibration.
For verification whether this procedure was successful you wait until the sensor sends the first message with SAS_CAL flag reset to zero. Then the sensor will accept the sent calibration message.

De-calibration procedure message can take in worst case up to 200ms, calibration procedure up to 500ms.

Functional Requirements:

CCW bit3	CCW bit2	CCW bit1	CCW bit0	Instruction
0	0	1	1	Request calibration and acceptance of SAS_CID
0	1	0	1	Reset SAS_CAL flag

Receiver of signal and signal features required by the receiver:

SAS

6.2.24 SCC1 Message

Message: SCC1	Identifier : 0420H

%%

Signal label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
ObjDisappearing	A target object disappearing signal at low speed range	0	1	00H	-
ACCFailInfo	Indication of SCC-malfunction	1	2	00H	-
ACCMode	Status of SCC-SCU	3	2	00H	0FH
MainMode_ACC	Main Switch Status of SCC	5	1	00H	-
StopReq	Stop request flag	6	1	00H	-
GoNotify	Go notify alert	7	1	00H	-
Free	Free	6	6	00H	-
AliveCounterACC	Message counter	12	4	00H	-
aReqMax	Acceleration Request Upper Limit	16	11	000H	7FFH
Free	Free	27	2	00H	-
aReqMin	Acceleration Request Lower Limit	29	11	000H	7FFH
VSetDis	Set speed	40	8	00H	FFH
ObjValid	Target object detected	48	1	00H	-
TakeOverReq	Take-over request	49	1	00H	-
DriverAlertDisplay	Driver display information	50	2	00H	-
TauGapSet	Set time gap	52	2	03H	-
DriverAlert	Alert signal to inform of SCC function cancel	54	1	00H	-
PreFill	Prefilling of brake system requested by SCC	55	1	00H	-
Free	Free	56	8	00H	-

Memory layout:

Free						56
PreFill	DriverAlert	TauGapSet	DriverAlertDisplay	TakeOverReq	ObjValid	48
VsetDis						40
aReqMin						32
aReqMin (LSB 3 bit)		Free		aReqMax (MSB 3 bit)		24
aReqMax						16
AliveCounterACC			Free			8
GoNotify	StopReq	MainMode_ACC	ACCMode	ACCFailInfo	ObjDisappearing	0

Transmission parameters - Conditions

System	SCC
Output period	20 ms
Output period tolerance	± 5 ms
Latency	max. 5 ms
Remote operation	no
Message Time out	500ms
Message Validity	IGN1
Phase relationship to another message	no

*NOTE : This message is for the “SCC(Smart Cruise Control)” system applied vehicles only

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ObjDisappearing	**A target object disappearing signal at low speed range**	**SCC1**	**0420H**	**0**	**1**

Signal definition:

This signal supports the driver to avoid possible collision with previously stopped vehicle when the preceding target is disappeared during the low speed following control.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H ... 01H

Conversion:

ObjDisappearing	Function
00H	No alert
01H	Object disappeared at low speed range

Receiver of signal and signal features required by the receiver:

CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ACCFailInfo	**Indication of SCC-malfunction**	**SCC1**	**0420H**	**1**	**2**

Signal definition:

This signal is evaluated by the driver information device to release the failure information to the driver. If this signal is set to anything other than 0, the TCS/ESC shall ignore any requests from SCC.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H ... 03H

Conversion:

ACCFailInfo	Function
00H	System without error
01H	Performance degredation
02H	System temporairy unavailable
03H	SCC Service Required

Receiver of signal and signal features required by the receiver:

ESC/TCS, CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ACCMode	**Status of SCC-SCU**	**SCC1**	**0420H**	**3**	**2**

Signal definition:

The signal *ACCMode* specifies the operational mode of SCC

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 03H

Conversion:

ACCMode	Function
00H	Off
01H	Engaged
02H	Override
03H	Shutoff

Receiver of signal and signal features required by the receiver:

ESC/TCS, CLU

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
MainMode_ ACC	**Main switch status of SCC**	**SCC1**	**0420H**	**5**	**1**

Signal definition:

This signal specifies the status of a Main switch of SCC system

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 01H

Conversion:

MainMode_ACC	Function
00H	OFF
01H	ON

Receiver of signal and signal features required by the receiver:

CLU

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit lnd.
StopReq	**Stop request flag**	**SCC1**	**0420H**	**6**	**1**

Signal definition:

A control request flag for vehicle stop. SCC expects vehicle to be controlled to a complete stop and hold its state.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 01H

Conversion:

StopReq	Function
00H	No request
01H	Stop control is required

Receiver of signal and signal features required by the receiver:

ESC

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit lnd.
GoNotify	**Go notify alert**	**SCC1**	**0420H**	**7**	**1**

Signal definition:

This signal supports the driver to identify the SCC system is ready to resume its control and informs that the driver should press the resume button or touch the gas pedal.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 01H

Conversion:

GoNotify	Function
00H	No message
01H	Driver can resume acceleration control

Receiver of signal and signal features required by the receiver:

CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
AliveCounterACC	**Message counter**	**SCC1**	**0420H**	**12**	**4**

Signal definition:

AliveCounterACC:
The signal *AliveCounterACC(n)* is incremented with each SCC message sent. This signal enables subsystems which are using signals from SCC to check whether the SCC message is updated or not.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 0FH

Conversion: (PH) = 1 * (HEX)

Receiver of signal and signal features required by the receiver:

ESC/TCS, CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
aReqMax	**Accelaration Request upper limit**	**SCC1**	**0420H**	**16**	**11**

Signal definition:

Together with aReqMin this signal represents the SCC acceleration request. If both signals carry the same value, SCC expects this value to be controlled to in a finite time. If aReqMax carries a different value than aReqMin, than both signals specify an acceleration span, where aReqMax is the upper limit and aReqMin is the lower limit.

Example: Deceleration limitation after driver override.
aReqMax = -0.5 m/s² and aReqMin = -1.5 m/s². In this case the SCC requires a deceleration of at least 0.5 but no more than 1.5 and expects the receiver to use the engine only to decelerate as much as possible.

Functional requirements:

Initial value: 000H

Error identifier: 7FFH

Physical range: -10.23 ... +10.23 m/s^2 = 00H ... 7FEH

Conversion : (PH) = (0.01 * (HEX)) – 10.23 [m/s^2]

Receiver of signal and signal features required by the receiver:
TCS/ESC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
aReqMin	**Accelaration Request lower limit**	**SCC1**	**0420H**	**29**	**11**

Signal definition:

See aReqMax.

Functional requirements:

Initial value: 000H

Error identifier: 7FFH

Physical range: -10.23 ... +10.23 m/s^2 = 00H ... 7FEH

Conversion : (PH) = (0.01 * (HEX)) – 10.23 [m/s^2]

Receiver of signal and signal features required by the receiver:
TCS/ESC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
VSetDis	**Set speed**	**SCC1**	**0420H**	**40**	**8**

Signal definition:

VSetDis:
The desired vehicle speed for free cruising has to be displayed all the time SCC is under active control.

※This signal can be sent in km/h or MPH according to the “SPEED_UNIT” signal (See CLU1 message).

Functional requirements:

Initial value: 00H

Error identifier: FFH

Physical range: 0 ... 254 km/h or MPH = 00H … FEH

Conversion: (PH) = 1.0 * (HEX) [km/h] or [MPH]

SPEED_UNIT = 0 : [km/h]
SPEED_UNIT = 1 : [MPH]

Receiver of signal and signal features required by the receiver:

CLU

Note:

Update Period : 100 ms

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ObjValid	**Target object detected**	**SCC1**	**0420H**	**48**	**1**

Signal definition:

ObjVaild:
If a in-path object is recognized by SCC, the driver should be informed.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H ... 01H

Conversion:

ObjValid	Function
0	No in-path object detected
1	In-path object detected

Receiver of signal and signal features required by the receiver:
CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
TakeOverReq	**Take-over request**	**SCC1**	**0420H**	**49**	**1**

Signal definition:

TakeOverReq:
The Take-over Request supports the driver to identify the limits of the SCC control. Reasons for such a request may be:

· Deceleration capability insufficient for the current situation.

Clutch actuation by the driver is necessary to avoid stopping of the engine. This signal shall activate an audible and visual alert

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H ... 01H

Conversion:

TakeOverReq	Function
0	No takeover request
1	Takeover request

Receiver of signal and signal features required by the receiver:
CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
DriverAlertDisplay	**Driver display information**	**SCC1**	**0420H**	**50**	**2**

Signal definition:

This signal carries the information which message shall be displayed to the driver when the SCC must be disengaged by the system or cann't be engaged.
A signal value unequal 00H is repeated for 5 messages cycles in order to ensure it appears for at least 100ms on the bus (Output period of SCC1 is 20ms).

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H ... 03H

Conversion:

DriverAlertDisplay	Function
00H	-
01H	Display "SCC Disengaged"
02H	Display "No SCC Engage Condition!"
03H	Reserved

Receiver of signal and signal features required by the receiver:
CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
TauGapSet	**Set time gap**	**SCC1**	**0420H**	**52**	**2**

Signal definition:

TauGapSet:
The desired time gap from which a following distance is extracted has to be presented to the driver at least if the value changes. The representation of the information depends on the display concept.

Functional requirements:

Initial value: 03H

Error identifier: -

Physical range: 00 ... 03H

Conversion:

TauGapSet	Function
00H	No time gap set
01H	Short distance
02H	Middle distance
03H	Long distance

Receiver of signal and signal features required by the receiver:
CLU

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
DriverAlert	**Alert signal to inform of SCC function cancel**	**SCC1**	**0420H**	**54**	**1**

Signal definition:

The DriverAlert supports the driver to identify the SCC system is cancelled automatically and informs the driver that SCC system does not operate any longer.
Condtions for cancel are :

- Vehicle speed reaches lower operation limit (or will reach soon) during SCC is engaged
- Chassis event during SCC is engaged

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 01H

Conversion:

DriverAlert	Function
00H	No Alert (Normal condition)
01H	SCC function is canceled

Receiver of signal and signal features required by the receiver:

CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
PreFill	**Prefilling of brake system requested by SCC**	**SCC1**	**0420H**	**55**	**1**

Signal definition:

Prefill:
This signal asks the ESC to pre-fill the system so that a fast reaction on the SCC deceleration command *AcvCv* can be achieved. The flag is set (to 1), if the SCC command value *AxvCv* is lower than a fixed value and can be set also after a successful brake control. The flag is reset (to 0) after a certain time.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H ... 01H

Conversion:

Prefill	Function
0	No pre-filling of the brake system is required
1	Pre-filling of the brake system is required

Receiver of signal and signal features required by the receiver:
ESC/TCS

Note:

6.2.25 SCC2 Message

Message: SCC2	Identifier : 05B5H

%%

Signal label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
ACC_ObjStatus	Status information of the SCC object	0	2	03H	-
ACC_ObjLatPos	Lateral position of the SCC object	8	9	1FFH	-
ACC_ObjDist	Distance to the SCC object	17	11	7FFH	-
ACC_ObjRelSpd	Relative speed to the SCC object	28	12	FFFH	-
Free	Free	40	24	00H	-

Memory layout:

Free			56
Free			48
Free			40
ACC_ObjRelSpd (MSB 8bit)			32
ACC_ObjRelSpd (LSB 4bit)	ACC_ObjDist (MSB 4bit)		24
ACC_ObjDist (LSB 7bit)		ACC_ObjLatPos (MSB 1bit)	16
ACC_ObjLatPos (LSB 8bit)			8
Free		ACC_ObjStatus	0

Transmission parameters - Conditions

System	SCC
Output period	50 ms
Output period tolerance	± 5 ms
Latency	max. 5 ms
Remote operation	no
Message Time out	500ms
Message Validity	IGN1
Phase relationship to another message	no

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ACC_ObjStatus	**Status information of the SCC object**	**SCC2**	**05B5H**	**0**	**2**

Signal definition:

This signal is describes the status or data valid information of the SCC object.

Functional requirements:

Initial value: 03H

Error identifier: -

Physical range: 00H ... 03H

Conversion:

ACC_ObjStatus	Function
00H	No SCC object detected
01H	SCC Object detected
02H	Reserved
03H	SCC Pre-Safe I/F inactive (No VI platform detected)

Receiver of signal and signal features required by the receiver:

ABS/ESC, PSB

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ACC_ObjLatPos	**Lateral position of the SCC object**	**SCC2**	**05B5H**	**8**	**9**

Signal definition:

This signal provides the lateral position of the detected SCC object regarding to the own vehicle. The position of the SCC object on the left side in driving direction of the vehicle longitudinal axis correlates with a negative signal value. Thus an SCC object on the right side in driving direction of the vehicle longitudinal axis correlates with a positive signal value.

Functional requirements:

Initial value: 1FFH

Error identifier: -

Physical range: -20 m ... 0 m … +20 m = 000H … 0C8H … 190H

Conversion: (PH) = 0.1 * (HEX) - 20 [m]

Receiver of signal and signal features required by the receiver:

ABS/ESC, PSB

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ACC_ObjDist	**Distance to the SCC object**	**SCC2**	**05B5H**	**17**	**11**

Signal definition:

This signal provides the distance to the in lane detected SCC object regarding to the own vehicle.

Functional requirements:

Initial value: 7FFH

Error identifier: -

Physical range: 0 m ... +150 m = 000H … 5DCH

Conversion: (PH) = 0.1 * (HEX) [m]

Receiver of signal and signal features required by the receiver:

ABS/ESC, PSB

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ACC_ObjRelSpd	**Relative speed to the SCC object**	**SCC2**	**05B5H**	**28**	**12**

Signal definition:

This signal provides the relative speed to the in lane detected SCC object regarding to the own vehicle.

Functional requirements:

Initial value: FFFH

Error identifier: -

Physical range: -170 m/s ... 0 m/s … +85 m/s = 000H … 6A4H … 9F6H

Conversion: (PH) = 0.1 * (HEX) - 170 [m/s]

Receiver of signal and signal features required by the receiver:

ABS/ESC, PSB

Note:

6.2.26 SCC3 Message

Message: SCC3	Identifier : 0388H

%%

Signal label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
CF_VSM_Prefill	Command to activate pre-fill	0	1	00H	
CF_VSM_DecCmdAct	Flag which indicates that the deceleration command from SCC (CR_VSM_DecCmd) is valid or not.	1	1	00H	-
CF_VSM_HBACmd	Command to use lowered HBA (Hydraulic Boost Assist) threshold to sensitize the HBA entrance	2	2	00H	-
CF_VSM_Warn	VSM warning level	4	2	00H	-
CF_VSM_Stat	Flag which tells status of APIA functionality	6	2	00H	-
CF_VSM_BeltCmd	Command to active the seat belt	8	3	00H	-
Free	Free	11	5	00H	-
CR_VSM_DecCmd	Deceleration command	16	8	00H	-
CF_VSM_ConfMode	Signal whitch shows the configuration mode of APIA/VSM2 function	24	3	00H	07H
Free	Free	27	29	00H	-
CR_VSM_Alive	SCC3 Message Alive-counter	56	4	00H	-
CR_VSM_ChkSum	SCC3 Message Checksum	60	4	00H	-

Memory layout:

CR_VSM_ChkSum		CR_VSM_Alive			56
Free					48
Free					40
Free					32
Free			CF_VSM_ConfMode		24
CR_VSM_DecCmd					16
Free			CF_VSM_BeltCmd		8
CF_VSM_Stat	CF_VSM_Warn	CF_VSM_HBACmd	CF_VSM_DecCmdAct	CF_VSM_Prefill	0

Transmission parameters - Conditions

System	SCC
Output period	20 ms
Output period tolerance	± 5 ms
Latency	max. 5 ms
Remote operation	no
Message Time out	500ms
Message Validity	IGN1
Phase relationship to another message	no

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_VSM_Prefill	**Command to activate pre-fill**	**SCC3**	**0388H**	**0**	**1**

Signal definition:

Depending on the driving situation, SCC tells ESC to apply brake slightly so that the gap between brake pad and disc is removed. The pre-fill enables the braking force to be generated as soon as the driver applies the brake. Without pre-fill, the initial travel of brake pedal does not generate braking force due to the gap between the brake pad and disc.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 01H

Conversion:

CF_VSM_Prefill	Function
00H	No pre-fill
01H	Pre-fill

Receiver of signal and signal features required by the receiver:

ESC

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_VSM_Dec CmdAct	**Flag which indicates that the deceleration command from SCC (CR_VSM_DecCmd) is valid or not.**	**SCC3**	**0388H**	**1**	**1**

Signal definition:

Depending on the driving situation, SCC tells ESC to apply brake to decelerate at CR_VSM_DecCmd (pre-brake, BA+) before the driver applies the brake. The signal is to indicate that CR_VSM_DecCmd is valid or not.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 01H

Conversion:

CF_VSM_DecCmdAct	Function
00H	No request
01H	Request valid

Receiver of signal and signal features required by the receiver:

ESC

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_VSM_HBACmd	**Command to use lowered HBA (Hydraulic Boost Assist) threshold to sensitize the HBA entrance**	**SCC3**	**0388H**	**2**	**2**

Signal definition:

Depending on the driving situation, SCC tells ESC to use lowered HBA (Hydraulic Boost Assist) threshold to sensitize the HBA entrance. The boost assist function is more easily activated than under normal driving condition.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 03H

Conversion:

CF_VSM_HBACmd	Function
00H	Standard threshold
01H	Lowered threshold 1
02H	Lowered threshold 2
03H	Lowered threshold 3

Receiver of signal and signal features required by the receiver:

ESC

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit lnd.
CF_VSM_Warn	**VSM warning level**	**SCC3**	**0388H**	**4**	**2**

Signal definition:

Request CLU to activate the corresponding warning device(s) according to the VSM warning level.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 03H

Conversion:

CF_VSM_Warn	Function
00H	No warning
01H	Warning level 1
02H	Warning level 2
03H	Warning level 3

Receiver of signal and signal features required by the receiver:

T.B.D.

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_VSM_Stat	**Flag which tells status of APIA functionality**	**SCC3**	**0388H**	**6**	**2**

Signal definition:

This signal indicates state signal from SCC to ESC, PSB and CLU which tells if APIA (Active Passive Integrated Approach) functionality is "not applicable", "available", "temporarily not available" or "permanently not available"

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 03H

Conversion:

CF_VSM_Stat	Function
00H	Not applicable
01H	Available
02H	Temporarily not available
03H	Permanently not available

Receiver of signal and signal features required by the receiver:

ESC, PSB, CLU

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_VSM_BeltCmd	**Command to active the seat belt**	**SCC3**	**0388H**	**8**	**3**

Signal definition:

Depending on the driving situation, VSM tells PSB to release(no alert), retract or pull the seat belt for occupant protection or warning.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 07H

Conversion:

CF_VSM_BeltCmd	Function
00H	Release / No alert
01H	Pre-crash full retraction
02H	Haptic warning
03H ~ 07H	Reserved

Receiver of signal and signal features required by the receiver:

PSB

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_VSM_DecCmd	**Deceleration command**	**SCC3**	**0388H**	**16**	**8**

Signal definition:

Depending on the driving situation, SCC gives ESC the deceleration command. ESC maintains the deceleration.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0.00 g ... 1.50 g = 00H … 96H

Conversion: (PH) = 0.01 * (HEX) [g]

Receiver of signal and signal features required by the receiver:

ESC

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_VSM_ConfMode	**Signal whitch shows the configuration mode of APIA/VSM2 function**	**SCC3**	**0388H**	**24**	**3**

Signal definition:

Signal which shows the configuration mode of APIA/VSM2 function.
The current configuration mode will be sent permanently. If it is required to control both, the LCD messages (tbd. seconds) and “VSM off” lamp (as long as “switched off” mode), then an additional value within this signal will be necessary, to separate LCD message and lamp control.

Functional requirements:

Initial value: 00H

Error identifier: 07H

Physical range: 00 ... 07H

Conversion:

CF_VSM_ConfMode	Function
00H	Reserved
01H	APIA/VSM2 all function off, only PSB full retraction activation signal on.
02H	APIA/VSM2 all function on, normal Pre-Warning
03H	APIA/VSM2 all function on, late Pre-Warning (Sports mode)
04H	Reserved
05H	Reserved
06H	Reserved
07H	Error Identifier

Receiver of signal and signal features required by the receiver:

CLU

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_VSM_Alive	**SCC3 Message Alive-counter**	**SCC3**	**0388H**	**56**	**4**

Signal definition:

This signal indicates Message counter (alive-counter) for robustness

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 0FH

Conversion: (PH) = 1 * (HEX)
0 … 14 : After the counter is 14 it starts again at 0
15 : signal invalid

Receiver of signal and signal features required by the receiver:

ESC, PSB

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_VSM_ChkSum	**SCC3 Message Checksum**	**SCC3**	**0388H**	**60**	**4**

Signal definition:

This signal indicates Checksum for robustness

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: -

Conversion: (PH) = 10h - (least significant nibbles of (Byte0 + Byte1 + Byte2 + Byte3 + Byte4 + Byte5 + Byte6 + Byte7) + most significant nibbles of (Byte0 + Byte1 + Byte2 + Byte3 + Byte4 + Byte5 + Byte6))

Receiver of signal and signal features required by the receiver:

ESC, PSB

Note:

6.2.27 EPB1 Message

%%

Message: EPB1	Identifier: 0433H

Signal label	Signal designation	Bit add.	Bit ind.	Init value	Error Ident.
EPB_I_LAMP	Info lamp request for cluster	0	4	00H	-
EPB_F_LAMP	Failure lamp request for cluster (yellow)	4	2	00H	-
EPB_ALARM	Audio output request	6	2	00H	-
EPB_CLU	Output data for cluster	8	8	00H	-
EPB_SWITCH	Status of EPB control switch	16	2	00H	03H
EPB_RBL	Rear brake light activation	18	1	00H	-
EPB_STATUS	Force status of EPB	19	3	00H	00H
EPB_FRC_ERR	Force status error description	22	2	00H	-
Free	Free	24	1	00H	-
ESP_ACK	Acknowledge for ESC request	25	1	00H	-
EPB_DBF_REQ	EPB Dynamic Braking request	26	1	00H	-
Free	Free	27	2	00H	-
EPB_FAIL	Information about the availability of EPB	29	3	02H	00H
EPB_FORCE	Actual force of EPB	32	12	000H	FFFH
Reserved	Reserved bits	44	4	00H	-
EPB_DBF_DECEL	Requested deceleration for DBF	48	8	00H	FFH
Reserved	Reserved bits	56	8	00H	-

Memory layout:

Reserved					56
EPB_DBF_DECEL					48
Reserved		EPB_FORCE (high)			40
EPB_FORCE (low)					32
EPB_FAIL	Free	EPB_DBF_REQ	ESP_ACK	Free	24
EPB_FRC_ERR	EPB_STATUS	EPB_RBL	EPB_SWITCH		16
EPB_CLU					8
EPB_ALARM	EPB_F_LAMP	EPB_I_LAMP			0

Transmission parameters – Conditions

System	EPB
Output period	20ms
Output period tolerance	+- 10ms
Latency	Max. 10msec
Transmit condition	IG-ON -OR- wakeup by switch
Remote operation	No
Message time out	500msec
Message Validity	IGN1
Phase relationship to another message	no

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit lnd.
EPB_I_LAMP	**Info lamp request for cluster**	**EPB1**	**0433H**	**0**	**4**

Signal definition:

This signal indicates status lamp request from EPB to lamp control unit.
- The lamp shall be turned on during initialization. The initialization lasts for 3 seconds after IG-key on.
- If a lamp control unit can not get this signal via CAN due to any errors, the last lamp state before the error should be maintained.
- When EPB apply switch is pressed in the IG-key off sate, the parking brake lamp should be on for 3 seconds and off. In this case, the cluster shall have CAN wake-up capability

See conversion table for details.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H .. 0FH

Conversion:

EPB_I_LAMP	Parking brake lamp status	EPB status
00H	Off	Release State (EPB/ AVH)
01H	On	Apply State (EPB)
02H	Blinking at 1Hz	Dynamic Braking (EPB) or Driver Action Requested
03H	-	Reserved
04H	On	Apply State (AVH)
05H – 07H	-	Reserved
08H	Blinking at 1Hz	Dynamic braking (AVH)
09H – 0EH	-	Reserved
0FH	Blinking at 3Hz	Diagnostic session

Receiver of signal and signal features required by the receiver:

CLU (Lamp control unit)

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit lnd.
EPB_F_LAMP	**Failure lamp request for cluster (yellow)**	**EPB1**	**0433H**	**4**	**2**

Signal definition:

Information about the failure lamp request from EPB to lamp control unit

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H .. 03H

Conversion:

EPB_F_LAMP	Yellow failure lamp status	Failure status
00H	Off	No failure
01H	On	Failure detected or in diagnosis mode
02H – 03H	-	Reserved

Receiver of signal and signal features required by the receiver:

CLU (Lamp control unit)

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit lnd.
EPB_ALARM	**Audio output request**	**EPB1**	**0433H**	**6**	**2**

Signal definition:

This signal indicates that an EPB requests cluster or tone controller to ring the alarm according to the status of an EPB.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H .. 03H

Conversion:

EPB_ALARM	Tone output	EPB status
00H	Off	Normal operation
01H	Comfortable tone	Driver information
02H	Uncomfortable tone	Dynamic braking
03H	Uncomfortable tone + warning alarm	Warning

Receiver of signal and signal features required by the receiver:

CLU (Tone control unit)

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit lnd.
EPB_CLU	**Output data for cluster display**	**EPB1**	**0433H**	**8**	**8**

Signal definition:

An EPB can show its information message to driver on a cluster or a display module with this signal.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: TBD

Conversion: TBD

Receiver of signal and signal features required by the receiver:

CLU (Display module)

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
EPB_SWITCH	**Status of EPB control switch**	**EPB1**	**0433H**	**16**	**2**

Signal definition:

Information about the EPB control switch state

.

Functional requirements:

Initial value: 00H

Error identifier: 03H

Physical range: 00H .. 03H

Conversion:

EPB_SWITCH	Switch status
00H	Neutral position
01H	Apply position (pull)
02H	Release position (push)
03H	Switch failure

Receiver of signal and signal features required by the receiver:

ESC

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit lnd.
EPB_RBL	**Rear brake light activation**	**EPB1**	**0433H**	**18**	**1**

Signal definition:

If an EPB acts braking and the vehicle speed is higher than pre-defined condition then rear brake lamp shall be turned on. This signal requests ESC or brake lamp controller to turn on rear brake lamp.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H .. 01H

Conversion:

EPB_RBL	Function
00H	No request
01H	Request to turn on rear brake lights

Receiver of signal and signal features required by the receiver:

ESC or Rear brake lights control unit

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit lnd.
EPB_STATUS	**Force status of EPB**	**EPB1**	**0433H**	**19**	**3**
EPB_FRC_ERR	**Force status error description**	**EPB1**	**0433H**	**22**	**2**

Signal definition:

EPB_STATUS:
Information about the force status of the EPB

EPB_FRC_ERR:
Detail descriptions of error status of EPB force if EPB_STATUS = 00H

Functional requirements EPB_STATUS:

Initial value: 00H

Error identifier: 00H

Physical range: 00H .. 07H

Conversion:

EPB_STATUS	EPB force status
00H	See details in EPB_FRC_ERR
01H	Released
02H	Clamped
03H	Clamping in progress
04H	Releasing in progress
05H	Dynamic braking via EPB

Functional requirements EPB_FRC_ERR:

Initial value: 00H

Error identifier: -

Physical range: 00H .. 03H

EPB_FRC_ERR	EPB force error detail
00H	No failure
01H	Clamp position not reached
02H	Emergency release
03H	Force not measurable (e.g. sensor failure)

Receiver of signal and signal features required by the receiver:

ESC

Note:

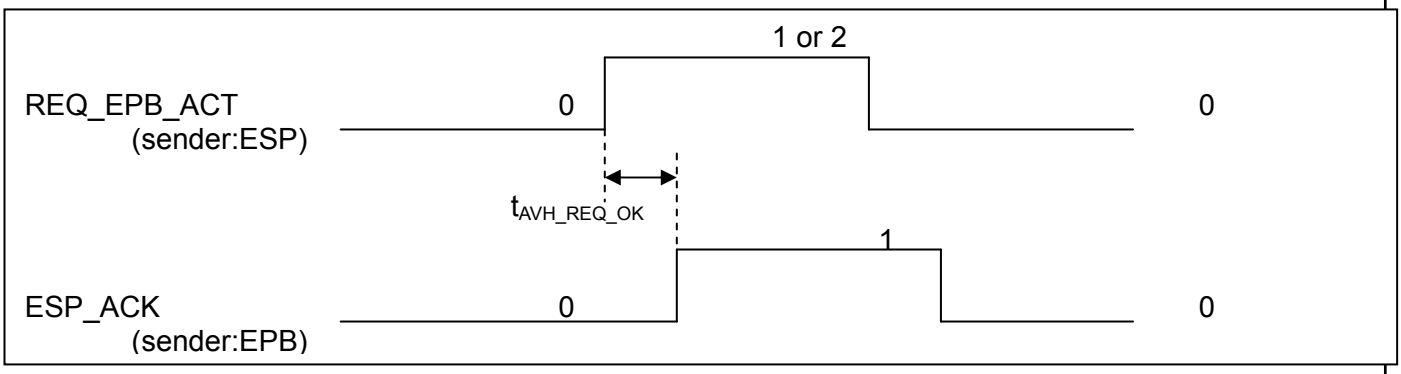
%%

LABEL	Designation	Message	Identifier	Bit add.	Bit lnd.
ESP_ACK	**Acknowledge for ESC request**	**EPB1**	**0433H**	**25**	**1**

Signal definition:

Acknowledge signal for ESC request (e.g. AVH).

ESC sends request to release (1) or clamping (2) via signal REQ_EPB_ACT. The EPB acknowledges this request with ESP_ACK = 1 within the time $t_{ESP_REQ_OK}$ (value tbd) and performs according to the requested action. If signal ESP_ACK remains = 0 for longer than $t_{ESP_REQ_OK}$, the requested action will be discarded.



Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H .. 01H

Conversion:

ESP_ACK	Function
00H	Idle / No acknowledge
01H	Acknowledge for external ESC request

Receiver of signal and signal features required by the receiver:

ESC

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit lnd.
EPB_DBF_REQ	**EPB dynamic Braking Request**	**EPB1**	**0433H**	**26**	**1**

Signal definition:

EPB dynamic Braking Request

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H .. 01H

Conversion:

EPB_DBF_REQ	Function
00H	No Request
01H	Dynamic braking request

Receiver of signal and signal features required by the receiver:

ESC

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit lnd.
EPB_FAIL	**Information about the availability of EPB**	**EPB1**	**0433H**	**29**	**3**

Signal definition:

Information about availability of EPB. If this bit is set (EPB is not available), EPB motor control is not possible, e.g. by external AVH request.

Functional requirements:

Initial value: 02H

Error identifier: 00H

Physical range: 00H .. 07H

Conversion:

EPB_FAIL	Function
00H	Not valid
01H	EPB No failure
02H	EPB Initialization State
03H	EPB Diagnostic
04H	EPB Temporarily Not Available
05H	EPB Permanently Not Available
06H	Reserved
07H	Reserved

Receiver of signal and signal features required by the receiver:

ESC

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit lnd.
EPB_FORCE	**Actual Force measured by EPB**	**EPB1**	**0433H**	**32**	**12**

Signal definition:

Actual braking force measured by EPB force sensor.

Functional requirements:

Initial value: 000H

Error identifier: FFFH

Physical range: -1000 … 3000 N = 000H … FA0H
(Where, -1000N = EPB fully released)

Conversion: (PH) = (HEX) – 1000 [N]

Receiver of signal and signal features required by the receiver:

ESC

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit lnd.
EPB_DBF_DECEL	**Requested deceleration for DBF**	**EPB1**	**0433H**	**48**	**8**

Signal definition:

Requested deceleration for DBF. The ESC must consider this value if EPB_DBF_REQ is equal to 1.

Functional requirements:

Initial value: 00H

Error identifier: FFH

Physical range: 0 … 2.54 g = 00H … FEH

Conversion: (PH) = 0.01 * (HEX) [g]

Receiver of signal and signal features required by the receiver:

ESC

Note:

6.2.28 CLU1 Message

Message: CLU1	Identifier: 04F0H

%%

Signal label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
CruiseSWStatus	Cruise operation control switch code	0	3	00H	07H
Reserved	Reserved	3	1	00H	-
CF_Clu_SldMainSW	Speed Limiter Main Switch On/Off Information	4	1	00H	-
Free	Free	5	1	00H	-
~~CF_Clu_TripInf~~	~~Trip computer Information~~	~~4~~	~~1~~	~~00H~~	~~-~~
~~CF_Clu_DispInf~~	~~Device Information of Display~~	~~5~~	~~1~~	~~00H~~	~~-~~
SPEED_UNIT	Kind of vehicle speed unit	6	1	00H	-
P_Brake_ACT	Parking brake (manual type) activation	7	1	00H	-
Vanz	Displayed vehicle speed	8	9	000H	1FFH
AliveCounter	Alive signal	17	7	00H	-
CruiseSW_Main	Cruise control main switch	24	1	00H	-
DashACCFail	Failure in SCC message detected by dashboard	25	1	00H	-
DISFail	Failure in display	26	1	00H	-
Reserved	Reserved	27	3	00H	-
CF_StrRly_Stat	Starter Relay High side driver status from PDM	30	1	00H	-
CF_ButSys_VarInd	Push Button start system variant Indicator	31	1	00H	-
R_TqAcnOutC	Calculated A/C comp. torque	32	8	00H	FFH
Odometer	Odometer – Mileage Information	40	24	Current	FFFFFFH

Memory layout:

Odometer (MSB)						56
Odometer						48
Odometer (LSB)						40
R_TqAcnOutC						32
CF_ButSys_VarInd	CF_StrRly_Stat	Reserved	DISFail	DashACCFail	CruiseSW_Main	24
AliveCounter					Vanz	16
Vanz						8
P_Brake_ACT	SPEED_UNIT	Free	CF_Clu_SldMainSW	Reserved	CruiseSWStatus	0

Transmission parameters - Conditions

System	CLU
Output period	20 ms
Output period tolerance	± 5 ms
Latency	max. 5 ms
Remote operation	no
Message Time out	500ms
Message Validity	IGN1
Phase relationship to another message	no

##

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CruiseSWStatus	**Cruise operation control switch code**	**CLU1**	**04F0H**	**0**	**3**
CruiseSW_Main	**Curise control main switch**	**CLU1**	**04F0H**	**24**	**1**

Signal definition:

CruiseSWStatus :

Six basic code should be provided.

1) Idle position / no button pressed (ActivationCode)
2) Resume / Plus
3) Set / Minus
4) ~~Time gap~~ Time gap (SCC only)
5) ~~Off~~ ACC/SCC cancel
6) Failure in availability of the control switches detected.

The signal is checked by SCC unit. If any failure is detected a failure representation code is transmitted.

CruiseSW_Main:

This signal enables or disables ACC/SCC function (ACC/SCC main switch). Default value of this sgnal is 0 and the value is set to 1 only while a driver is pressing the ACC/SCC main switch. This signal changes enable/disable state of SCC function according to MainMode_SCC signal of SCC.

Functional requirements:

Initial value: 00H

Error identifier: 07H

Physical range: 00H … 06H

Conversion:

CruiseSWStatus	Function
00H	Idle Position
01H	Resume / Plus
02H	Set / Minus
03H	~~Time gap (Distance)~~ Time gap (Distance, SCC only)
04H	~~SCC off~~ ACC/SCC cancel
05H .. 06H	Reserved
07H	Failure in Control Switches

Conversion:

CruiseSW_Main	Function
00H	ACC/SCC main switch not pressed (Idle position)
01H	ACC/SCC main switch pressed (Enable/Dsable SCC)

Receiver of signal and signal features required by the receiver:
SCC, EMS

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit lnd.
CF_Clu_SldMainSW	**Speed Limiter Main Switch On/Off Information**	**CLU1**	**04F0H**	**4**	**1**

Signal definition:

This signal represents operating status of Speed Limiter Main Switch in Steering Wheel. This signal enables or disables SLD function (SLD main switch). Default value of this signal is 0 and the value is set to 1 only while a driver is pressing the SLD main switch. This signal changes enable/disable state of SLD function according to steering wheel remote switch.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H … 01H

Conversion:

CF_Clu_SldMainSW	Function
0	SLD main switch not pressed (Idle position)
1	SLD main switch pressed (Enable/Disable SLD)

Receiver of signal and signal features required by the receiver:
EMS

Note:

%%

~~LABEL~~	~~Designation~~	~~Message~~	~~Identifier~~	~~Bit add.~~	~~Bit lnd.~~
~~CF_Clu_TripInf~~	~~Trip-computer Information~~	~~CLU1~~	~~04F0H~~	~~4~~	~~1~~

~~Signal definition:~~

~~This signal indicates information of Trip computer in cluster. Cluster sends information of a Trip computer to CUbiS.~~

~~Functional requirements:~~

~~Initial value: 00H~~

~~Error identifier:~~

~~Physical range: 00H ... 01H~~

~~Conversion:~~

~~CF_Clu_TripInf~~	~~Function~~
~~0~~	~~Non Trip-computer in cluster~~
~~1~~	~~Trip-computer in cluster~~

~~Receiver of signal and signal features required by the receiver:~~
~~CUbiS~~

~~Note:~~

%%

~~LABEL~~	~~Designation~~	~~Message~~	~~Identifier~~	~~Bit add.~~	~~Bit lnd.~~
~~CF_Clu_DispInf~~	~~Device Information of Display~~	~~CLU1~~	~~04F0H~~	~~5~~	~~1~~

~~Signal definition:~~

~~This signal indicates device information of display in cluster. Cluster sends information of display to CUbiS.~~

~~Functional requirements:~~

~~Initial value: 00H~~

~~Error identifier: -~~

~~Physical range: 00H ... 01H~~

~~Conversion:~~

~~CF_Clu_DispInf~~	~~Function~~
~~0~~	~~Segment LCD~~
~~1~~	~~Dot Matrix (or TFT) LCD~~

~~Receiver of signal and signal features required by the receiver:~~
~~CUbiS~~

~~Note:~~

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
Vanz	**Displayed vehicle speed**	**CLU1**	**04F0H**	**8**	**9**
SPEED_UNIT	**Kind of vehicle speed unit**	**CLU1**	**04F0H**	**6**	**1**

Signal definition:

Vanz :
The vehicle speed which is indicated in the speedmeter has to be sent to SCC. This value is used for evalution of SCC command values instead of the vehicle velocity in order to avoid significant difference between the speedmeter indicator and the set speed indicator(especially in the case of free cruising with the set speed). In terms of debouning and presnce on CAN, the same time scales have to be used and described for time gap setting.
This signal should be sent in km/h or MPH according to the “SPEED_UNIT” signal.

SPEED_UNIT :
This signal indicates the unit of the speed displayed in the speedometer

Functional requirements:

Initial value: 00H

Error identifier: 1FFH

Physical range: 0 ... 255 km/h or MPH = 00H … 1FEH

Conversion: (PH) = 0.5 * (HEX) [km/h] or [MPH]

SPEED_UNIT = 0 : [km/h]
SPEED_UNIT = 1 : [MPH]

Receiver of signal and signal features required by the receiver:
%%
SCC, LDWS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
P_Brake_ACT	**Parking brake(manual type) activation**	**CLU1**	**04F0H**	**7**	**1**

Signal definition:

This signal indicates whether the conventional (manual type) parking brake is activated or not.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H … 01H

Conversion:

P_Brake_ACT	Function
0	Parking brake is not activated
1	Parking brake is activated

Receiver of signal and signal features required by the receiver:
SCC, ESC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
AliveCounter	**Alive signal**	**CLU1**	**04F0H**	**17**	**7**

Signal definition:

AliveCounter:
This cyclic counter indicates the actuality of the dashboard message.
This signal counts up every 20msec.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H … 7FH

Conversion: -

Receiver of signal and signal features required by the receiver:
%%
SCC, EPB

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
DashACCFail	**Failure in SCC message detected by dashboard**	**CLU1**	**04F0H**	**25**	**1**

Signal definition:

DashACCFail:
This fail is set by the dashboard safety logic if a monitoring responds concerning SCC(timeout of SCC message, inconsistency in data or failure in alive counter). DashACCFail may not appear as response to a failure information received from SCC.
In order to distinguish between a reversible(e.g. timeout) and an irreversible SCC shut off, the information might be split into two signals.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 01H

Conversion:

DashACCFail	Function
0	No failure
1	Failure

Receiver of signal and signal features required by the receiver:

SCC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
DISFail	**Main switch**	**CLU1**	**04F0H**	**26**	**1**

Signal definition:

DISFail:
This flag indicates a failure state in the dashboard function that disables the indication of SCC relevant information. It is generated by the dashboard safety logic due to detected internal failure or failure in it's peripherals. DISFail may not appear as response of a failure information received from SCC.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 01H

Conversion:

DISFail	Function
0	No failure
1	Failure

Receiver of signal and signal features required by the receiver:
SCC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_StrRly_Stat	**Starter Relay High side driver status from PDM**	**CLU1**	**04F0H**	**30**	**1**

Signal definition:

In case of the Push button start system, PDM control the Starter Relay High side for clanking if Start is required by User. This signal for immobilizer authentication requests signal of EMS.
If EMS immobilizer status is locked, EMS will start communication for immobilizer authentication as soon as this CAN signal is issued.
Cluster receives it from PDM unit of body CAN bus and transmits to the high speed CAN bus with same signal as a gateway.
The signal in the body CAN bus “C_StarterRelayStatus” is cyclic with 200ms period. During the time between the signal is updated, cluster repeats with latest value of “C_StarterRelayStatus”.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 01H

Conversion:

CF_StrRly_Stat	Function
0	Starter relay output OFF
1	Starter relay output ON

Receiver of signal and signal features required by the receiver:
EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_ButSys_VarInd	**Push Button start system variant Indicator**	**CLU1**	**04F0H**	**31**	**1**

Signal definition:

This signal means the car has push start system. EMS wil use this signal for variant indicator.
Cluster receives it from PDM unit of body CAN bus and transmits to the high speed CAN bus with same signal as a gateway.
The signal in the body CAN bus “C_PushStartOption” is cyclic with 200ms period. During the time between the signal is updated, cluster repeats with latest value of “C_PushStartOption”.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 01H

Conversion:

CF_ButSys_VarInd	Function
0	Non PushStartOption
1	PushStartOption

Receiver of signal and signal features required by the receiver:
EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
R_TqAcnOutC	**Calculated A/C COMP Torque**	**CLU1**	**04F0H**	**32**	**8**

Signal definition:

This signal indicates calculated A/C compressure torque.
Cluster receives it from DATC unit of body CAN bus and transmits to the high speed CAN bus with same signal as a gateway.
The signal in the body CAN bus “DATCmsg01” is cyclic with 200ms period. During the time between the signal is updated, cluster repeats with latest value of “DATCmsg01”.

Functional requirements:

Initial value: 00H

Error identifier: FFH

Physical range: 0 ~ 50.8 Nm = 00H ... FEH

Conversion: (PH) = 0.2 * (HEX) [Nm]

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
Odometer	**Odometer–Mileage information**	**CLU1**	**04F0H**	**40**	**24**

Signal definition:

Odometer:
This signal indicates mileage counter of a vehicle. Cluster calculates total mileage and sends it to SCC and CUbiS. This value shall be the same with the mileage that is displayed to a driver.

Functional requirements:

Initial value: Current mileage

Error identifier: FFFFFFH

Physical range: 0 ... 1,000,000 km = 000000H ... 989680H

Conversion: (PH) = (HEX) X 0.1 km

Receiver of signal and signal features required by the receiver:
%%
SCC, CUbiS, EPB

Note:

6.2.29 CLU2 Message

Message: CLU2	Identifier: 0690H

##

Signal label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
IGN_SW	Ignition key switch status	0	3	00H	-
RKE_CMD	Keyless command	3	3	00H	-
DRV_DR_SW	Driver door switch	6	2	00H	-
DRV_Key_Lock	Driver door key lock	8	1	00H	-
DRV_Key_Unlock	Driver door key unlock	9	1	00H	-
PIC_Lock	PIC passive access lock for door module	10	3	00H	-
PIC_Unlock	PIC passive access unlock for door module	13	3	00H	-
DRV_Seat_Belt	Driver seat belt On/Off status	16	2	00H	-
TRUNK_OPEN_STATUS	Trunk Latch Switch signal	18	2	00H	-
PAS_Seat_Belt	Passenger Seat Belt On/Off Status	20	2	00H	-
CF_HoodStat	Hood Latch Switch signal	22	2	00H	-
CF_Clu_TurnSigLh	Status of Left Turn Signal On/Off	24	1	00H	-
CF_Clu_TurnSigRh	Status of Right Turn Signal On/Off	25	1	00H	-
CF_Clu_LdwsSW	Operation LDWS Switch	26	1	00H	-
CF_Clu_WiperIntT	Wiper INT T value from MF SW	27	3	00H	-
CF_Clu_WiperIntSW	Wiper INT switch signal from MF SW	30	1	00H	-
CF_Clu_WiperLow	Wiper Low switch signal from MF SW	31	1	00H	-
CF_Clu_WiperHigh	Wiper High switch signal from MF SW	32	1	00H	-
CF_Clu_WiperAuto	Wiper Auto switch signal from MF SW	33	1	00H	-
CF_Clu_RainSnsStat	Status of Rain Sensor	34	3	00H	-
CF_Clu_HeadLampLow	Head Lamp Low Beam On/Off Information	37	1	00H	-
CF_Clu_HeadLampHigh	Head Lamp High Beam On/Off Information	38	1	00H	-
CF_Clu_AltLStatus	Alternator L port Status	39	1	00H	-
CF_Clu_EcoDriveInf	Information of Economy Drive Indication	40	3	00H	07H
CF_Clu_SwiGearR	MT Gear R Switch signal	43	2	00H	-
CF_SWL_Stat	SRS Warning lamp status	45	3	00H	07H
CF_Clu_ActiveEcoSW	Indication of Active ECO switch	48	1	00H	-
CF_Clu_HazardSW	Hazard Switch Status	49	1	00H	-
CF_Clu_AliveCnt2	Alive Counter	50	4	00H	-
Free	Free	54	10	00H	-

Memory layout:

<table>
<tr><td colspan="8">Free</td><td>56</td></tr>
<tr><td colspan="2">Free</td><td colspan="4">CF_Clu_AliveCnt2</td><td>CF_Clu_HazardSW</td><td>CF_Clu_ActiveEcoSW</td><td>48</td></tr>
<tr><td colspan="3">CF_SWL_Stat</td><td colspan="2">CF_Clu_SwiGearR</td><td colspan="3">CF_Clu_EcoDriveInf</td><td>40</td></tr>
<tr><td>CF_Clu_AltLStatus</td><td>CF_Clu_HeadLampHigh</td><td>CF_Clu_HeadLampLow</td><td colspan="4">CF_Clu_RainSnsStat</td><td>CF_Clu_WiperAuto</td><td>CF_Clu_WiperHigh</td><td>32</td></tr>
<tr><td>CF_Clu_WiperLow</td><td>CF_Clu_WiperIntSW</td><td colspan="4">CF_Clu_WiperIntT</td><td>CF_Clu_LdwsSW</td><td>CF_Clu_TurnSigRh</td><td>CF_Clu_TurnSigLh</td><td>24</td></tr>
<tr><td colspan="3">CF_HoodStat</td><td colspan="3">PAS_Seat_Belt</td><td colspan="2">TRUNK_OPEN_STATUS</td><td colspan="2">DRV_Seat_Belt</td><td>16</td></tr>
<tr><td colspan="4">PIC_Unlock</td><td colspan="4">PIC_Lock</td><td>DRV_Key_Unlock</td><td>DRV_Key_Lock</td><td>8</td></tr>
<tr><td colspan="3">DRV_DR_SW</td><td colspan="3">RKE_CMD</td><td colspan="3">IGN_SW</td><td>0</td></tr>
</table>

Transmission parameters - Conditions

System	Cluster
Output period	100 ms
Output period tolerance	± 5 ms
Latency	max. 20 ms
Remote operation	no
Message Time out	None
Message Validity	IGN1
Phase relationship to another message	Body CAN Messages : IPMmsg01, IPMmsg02, DDMmsg01, MFSWmsg01, FAMmsg01

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
IGN_SW	**Ignition key switch status**	**CLU2**	**0690H**	**0**	**3**

Signal definition:

This signal represents ignition key switch staus which of information is coming from IPM unit in the B-CAN (B-CAN Name : IGNSW). Cluster transmits the same signal from B-CAN to C-CAN as gateway.
The update period of IPMmsg02 is 200ms. During the time between IPMmsg02 update, cluster repeats its transmission with lastest value which received from IPMmsg02.

When the incoming B-CAN signal is timeout, cluster transmits last value received to C-CAN.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H … 07H

Conversion:

IGN_SW	Function
00H	Key Off
01H	Key In
02H	ACC
03H	IGN
04H	Start
05H .. 07H	Reserved

Receiver of signal and signal features required by the receiver:
%%
ECS, EPB

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
RKE_CMD	**Keyless command**	**CLU2**	**0690H**	**3**	**3**

Signal definition:

This signal represents keyless command. It is coming from IPMmsg01 in the B-CAN and cluster transmits the same signal to C-CAN as gateway. (B-CAN name : RKECMD)
The message type of IPMmsg01 is repeat 3 times on event. During the time between this signal update, cluster repeats its transmission with lastest value which received from IPMmsg01.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0 ... 07H

Conversion:

RKE_CMD	Function
00H	None
01H	Lock & No.1
02H	Unlock & No.1
03H	Lock & No.2
04H	Unlock & No.2
05H	Lock
06H	Unlock
07H	Reserved

Receiver of signal and signal features required by the receiver:

ECS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
DRV_DR_SW	**Driver door switch**	**CLU2**	**0690H**	**6**	**2**

Signal definition:

This signal represents driver side door status. It is coming from IPMmsg02 in the B-CAN and cluster transmits the same signal to C-CAN as gateway. (B-CAN Name : DRVDRSW)
The update period of IPMmsg02 is 200ms. During the time between IPMmsg02 update, cluster repeats its transmission with lastest value which received from IPMmsg02.

When the incoming B-CAN signal is timeout, cluster transmits last value received to C-CAN.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 03H

Conversion:

DRV_DR_SW	Function
00H	Close
01H	Open
02H	Reserved
03H	Invalid (IPMmsg02 TIME-OUT)

Receiver of signal and signal features required by the receiver:
%%
ESC, ECS, EPB

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
DRV_Key_Lock	**Driver door key lock**	**CLU2**	**0690H**	**8**	**1**
DRV_Key_Unlock	**Driver door key unlock**	**CLU2**	**0690H**	**9**	**1**

Signal definition:

DRV_Key_Lock :
Driver side door key lock.

DRV_Key_Unlock :
Driver side door key unlock.

The signals are coming from B-CAN DDMmsg01 which of signal type is repeat 3 times on event and cluster transmits the same signal to C-CAN as gateway.
During the time between the signal is update, cluster repeats its transmission with lastest value which received from IPMmsg01.

Both signals are not set at the same time.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 01H

Conversion:

DRV_Key_Lock	Function
00H	Off
01H	Driver door key lock

Conversion:

DRV_Key_Unlock	Function
00H	Off
01H	Driver door key unlock

Receiver of signal and signal features required by the receiver:

ECS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
PIC_Lock	**PIC passive access lock for door module**	**CLU2**	**0690H**	**10**	**3**
PIC_Unlock	**PIC passive access unlock for door module**	**CLU2**	**0690H**	**13**	**3**

Signal definition:

PIC_Lock :
PIC passive access lock for door module.

PIC_Unlock :
PIC passive access unlock for door module.

The signals are coming from B-CAN IPMmsg01 which of signal type is repeat 3 times on event and cluster transmits the same signal to C-CAN as gateway. During the time between the signal is update, cluster repeats its transmission with lastest value which received from IPMmsg01.
(B-CAN Name : PassiveAccessLock, PassiveAccessUnlock)

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H … 07H

Conversion:

PIC_Lock	Function
00H	None
01H	Lock & No.1
02H	Lock & No.2
03H	Lock
04H – 07H	Reserved

Conversion:

PIC_Unlock	Function
00H	None
01H	Unlock & No.1
02H	Unlock & No.2
03H	Unlock
04H	PIC Key Reminder
05H – 07H	Reserved

Receiver of signal and signal features required by the receiver:

ECS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
DRV_Seat_Belt	**Driver Seat Belt On/Off Status**	**CLU2**	**0690H**	**16**	**2**

Signal definition:

This signal represents driver seat belt indication command. It is coming from IPMmsg02 in the B-CAN and cluster transmits the same signal to C-CAN as gateway. (B-CAN Name : C_DRVSeatBeltSW)
The update period of IPMmsg02 is 200ms. During the time between IPMmsg02 update, cluster repeats its transmission with lastest value which received from IPMmsg02.

When the incoming B-CAN signal is timeout, cluster transmits last value received to C-CAN.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 03H

Conversion:

DRV_Seat_Belt	Function
00H	Belted
01H	Unbelted
02H	Failed
03H	Invalid (IPMmsg02 TIME-OUT)

Receiver of signal and signal features required by the receiver:
%%
ESC, PSB, EPB

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
TRUNK_OPEN_STATUS	**Trunk Latch Switch signal**	**CLU2**	**0690H**	**18**	**2**

Signal definition:

This signal represents Trunk OPEN/CLOSE status. It is coming from IPMmsg02 in the B-CAN and cluster transmits the same signal to C-CAN as gateway. (B-CAN Name : C_TrunkOpenIND)
The update period of IPMmsg02 is 200ms. During the time between IPMmsg02 update, cluster repeats its transmission with last value which received from IPMmsg02.

When the incoming B-CAN signal is timeout, cluster transmits last value received to C-CAN.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 03H

Conversion:

TRUNK_OPEN_STATUS	Function
00H	Trunk Close
01H	Trunk Open
02H	Reserved
03H	Invalid (IPMmsg02 TIME-OUT)

Receiver of signal and signal features required by the receiver:

ECS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
PAS_Seat_Belt	**Passenger Seat Belt On/Off Status**	**CLU2**	**0690H**	**20**	**2**

Signal definition:

This signal represents driver seat belt indication command. It is coming from IPMmsg02 in the B-CAN and cluster transmits the same signal to C-CAN as gateway.
(B-CAN Name : C_ASTSeatBeltSW)
The update period of IPMmsg02 is 200ms. During the time between IPMmsg02 update, cluster repeats its transmission with lastest value which received from IPMmsg02.

When the incoming B-CAN signal is timeout, cluster transmits last value received to C-CAN.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 03H

Conversion:

PAS_Seat_Belt	Function
00H	Belted
01H	Unbelted
02H	Failed
03H	Invalid (IPMmsg02 TIME-OUT)

Receiver of signal and signal features required by the receiver:

PSB

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_HoodStat	**Hood Latch Switch signal**	**CLU2**	**0690H**	**22**	**2**

Signal definition:

This signal represents the hood state. It is coming from IPMmsg02 in the B-CAN and cluster transmits the same signal to C-CAN as gateway. (B-CAN Name : C_HoodSW)
The update period of IPMmsg02 is 200ms. During the time between IPMmsg02 update, cluster repeats its transmission with last valid value which received from IPMmsg02.

When the incoming B-CAN signal is timeout, cluster transmits the value for invalid signal to C-CAN.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 03H

Conversion:

CF_HoodStat	Function
00H	Hood Close
01H	Hood Open
02H	Reserved
03H	Invalid (IPMmsg02 TIME-OUT)

Receiver of signal and signal features required by the receiver:

ESC, EPB

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Clu_TurnSigLh	**Status of Left Turn Signal On/Off**	**CLU2**	**0690H**	**24**	**1**

Signal definition:

This signal represents the left turn signal state. It is coming from MFSW in the B-CAN and cluster transmits the same signal to C-CAN as gateway. (B-CAN Name : C_TSigLHSW)
When the incoming B-CAN signal is timeout, cluster transmits the value for invalid signal to C-CAN.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 01H

Conversion:

CF_Clu_TurnSig_Lh	Function
00H	OFF(the value for invalid signal)
01H	ON

Receiver of signal and signal features required by the receiver:

LDWS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Clu_TurnSigRh	**Status of Right Turn Signal On/Off**	**CLU2**	**0690H**	**25**	**1**

Signal definition:

This signal represents the right turn signal state. It is coming from MFSW in the B-CAN and cluster transmits the same signal to C-CAN as gateway. (B-CAN Name : C_TSigRHSW)
When the incoming B-CAN signal is timeout, cluster transmits the value for invalid signal to C-CAN.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 01H

Conversion:

CF_Clu_TurnSigRh	Function
00H	OFF(the value for invalid signal)
01H	ON

Receiver of signal and signal features required by the receiver:

LDWS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Clu_LdwsSW	**Operation LDWS Switch**	**CLU2**	**0690H**	**26**	**1**

Signal definition:

This signal represents the LDWS switch signal state. It is coming from SWRC in the B-CAN and cluster transmits the same signal to C-CAN as gateway. (B-CAN Name : C_LDWSSW)
When the incoming B-CAN signal is timeout, cluster transmits the value for invalid signal to C-CAN.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 01H

Conversion:

CF_Clu_LdwsSW	Function
00H	OFF(the value for invalid signal)
01H	ON

Receiver of signal and signal features required by the receiver:

LDWS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Clu_WiperIntT	**Wiper INT T value from MFSW**	**CLU2**	**0690H**	**27**	**3**

Signal definition:

This signal represents the Wiper INT T value. It is coming from MFSW in the B-CAN and cluster transmits the same signal to C-CAN as gateway. (B-CAN Name : C_WiperIntT)
When the incoming B-CAN signal is timeout, cluster transmits the value for invalid signal to C-CAN.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 04H

Conversion:

CF_Clu_WiperIntT	Function
00H	Step 1(the value for invalid signal)
01H	Step 2
02H	Step 3
03H	Step 4
04H	Step 5

Receiver of signal and signal features required by the receiver:

LDWS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Clu_WiperIntSW	**Wiper INT switch signal from MF SW**	**CLU2**	**0690H**	**30**	**1**

Signal definition:

This signal represents the Wiper INT switch signal state. It is coming from MFSW in the B-CAN and cluster transmits the same signal to C-CAN as gateway. (B-CAN Name : C_WiperIntSW)
When the incoming B-CAN signal is timeout, cluster transmits the value for invalid signal to C-CAN.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 01H

Conversion:

CF_Clu_WiperIntSW	Function
00H	OFF(the value for invalid signal)
01H	ON

Receiver of signal and signal features required by the receiver:

LDWS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Clu_WiperLow	**Wiper Low switch signal from MF SW**	**CLU2**	**0690H**	**31**	**1**

Signal definition:

This signal represents the wiper low switch signal state. It is coming from MFSW in the B-CAN and cluster transmits the same signal to C-CAN as gateway. (B-CAN Name : C_WiperLowSW)
When the incoming B-CAN signal is timeout, cluster transmits the value for invalid signal to C-CAN.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 01H

Conversion:

CF_Clu_WiperLow	Function
00H	OFF(the value for invalid signal)
01H	ON

Receiver of signal and signal features required by the receiver:

LDWS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Clu_WiperHigh	**Wiper High switch signal from MF SW**	**CLU2**	**0690H**	**32**	**1**

Signal definition:

This signal represents the wiper high switch signal state. It is coming from MFSW in the B-CAN and cluster transmits the same signal to C-CAN as gateway. (B-CAN Name : C_WiperHighSW)
When the incoming B-CAN signal is timeout, cluster transmits the value for invalid signal to C-CAN.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 01H

Conversion:

CF_Clu_WiperHigh	Function
00H	OFF(the value for invalid signal)
01H	ON

Receiver of signal and signal features required by the receiver:

LDWS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Clu_WiperAuto	**Wiper Auto switch signal from MF SW**	**CLU2**	**0690H**	**33**	**1**

Signal definition:

This signal represents the wiper auto switch signal state. It is coming from MFSW in the B-CAN and cluster transmits the same signal to C-CAN as gateway. (B-CAN Name : C_WiperAutoSW)
When the incoming B-CAN signal is timeout, cluster transmits the value for invalid signal to C-CAN.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 01H

Conversion:

CF_Clu_WiperAuto	Function
00H	OFF(the value for invalid signal)
01H	ON

Receiver of signal and signal features required by the receiver:

LDWS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Clu_RainSnsStat	**Status of Rain Sensor**	**CLU2**	**0690H**	**34**	**3**

Signal definition:

This signal represents the status of Rain Sensor signal state. It is coming from FAM in the B-CAN and cluster transmits the same signal to C-CAN as gateway. (B-CAN Name : C_RainSNSRStatus)
When the incoming B-CAN signal is timeout, cluster transmits the value for invalid signal to C-CAN.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 06H

Conversion:

CF_Clu_RainSnsStat	Function
00H	OFF
01H	Rain Detected
02H	Low
03H	High
04H	Fault 1
05H	Fault 2
06H	Fault 3

Receiver of signal and signal features required by the receiver:

LDWS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Clu_HeadLamp Low	**Head Lamp Low Beam On/Off Information**	**CLU2**	**0690H**	**37**	**1**

Signal definition:

This signal represents headlamp low beam status. It is coming from IPMmsg03 or BOXmsg02 in the B-CAN and cluster transmits the same signal to C-CAN as gateway.
(B-CAN name : C_HeadLampLowIND or C_HLampLOW_Act)

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 01H

Conversion:

CF_Clu_HeadLampLow	Function
00H	Head Lamp Low Beam Off
01H	Head Lamp Low Beam On

Receiver of signal and signal features required by the receiver:

EMS, AFLS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Clu_HeadLamp High	**Head Lamp High Beam On/Off Information**	**CLU2**	**0690H**	**38**	**1**

Signal definition:

This signal represents headlamp low beam status. It is coming from IPMmsg03 or BOXmsg02 in the B-CAN and cluster transmits the same signal to C-CAN as gateway.
(B-CAN name : C_HeadLampHighIND or C_HLampHIGH_Act)

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 01H

Conversion:

CF_Clu_HeadLampHigh	Function
00H	Head Lamp High Beam Off
01H	Head Lamp High Beam On

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Clu_AltLStatus	**Alternator L port Status**	**CLU2**	**0690H**	**39**	**1**

Signal definition:

This signal indicates the status of alternator L port. Cluster sends the information of the alternator L port to MTC/DATC.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 01H

Conversion:

CF_Clu_AltLStatus	Function
00H	Off (Low)
01H	On (Open or High)

Receiver of signal and signal features required by the receiver:

MTC/FATC/DATC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Clu_EcoDriveInf	**Information of Economy Drive Indication**	**CLU2**	**0690H**	**40**	**3**

Signal definition:

This signal indicates the information of Eco-Drive indicator status. The cluster sends the calculated information of Eco-drive indicator status to CUbiS.

Functional requirements:

Initial value: 00H

Error identifier: 07H

Physical range: 0 … 6 = 00 ... 06H

Conversion:

CF_Clu_EcoDriveInf	Function
00H	Not Activated
01H	Green Lamp On
02H	Yellow Lamp On
03H	Red Lamp On
04H	Reserved
05H	Reserved
06H	Reserved
07H	Error

Receiver of signal and signal features required by the receiver:

CUbiS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Clu_SwiGearR	**MT Gear R Switch signal**	**CLU2**	**0690H**	**43**	**2**

Signal definition:

This signal indicates the MT Gear R Switch signal for ESC system.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0 … 3 = 00 ... 03H

Conversion:

CF_Clu_SwiGearR	Function
00H	Gear_R Switch Off
01H	Gear_R Switch On
02H	Reserved
03H	Invalid

Receiver of signal and signal features required by the receiver:
%%
ESC, SPAS, EPB

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_SWL_Stat	**SRS Warning lamp status**	**CLU2**	**0690H**	**45**	**3**

Signal definition:

This signal is generated by one of the following 5 self-diagnostic result of micro-controller of Cluster.
1) “Lamp ON” status as a self-status diagnostic result of cluster
2) “Lamp OFF” status as a self-status diagnostic result of cluster
3) “Lamp flashing with 1hz frequency / 50% duty ratio” as a self-status result diagnostic result of cluster
4) “Lamp Circuit Failure” as a self-diagnostic result of cluster circuit
5) “No Valid ACU message” as ACU4 message check result by cluster

Note to be taken that CLU2 message does not include judgment on “SRS W/Lamp failure in terms of airbag system”. CLU2 message only contains “status and diagnostic result of Cluster itself”.

Functional requirements:

Initial value: 00H

Error identifier: 07H

Physical range: 0 … 7 = 00 ... 07H

Conversion:

CF_SWL_Stat	Function
00H	Lamp OFF
01H	Lamp On
02H	Lamp Flashing
03H	ACU message error
04H ~ 06H	Reserved
07H	Lamp Circuit Failure

Receiver of signal and signal features required by the receiver:

ACU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Clu_ActiveEcoSW	**Indication of Active ECO switch**	**CLU2**	**0690H**	**48**	**1**

Signal definition:

This signal indicates that the Active ECO switch is active or not. When Active ECO switch is activated (pressed), its value is 01H otherwise its value is 00H.
If Active ECO does not support, this signal value is 00H.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0 … 1 = 00 ... 01H

Conversion:

CF_Clu_ActiveEcoSW	Function
00H	Active ECO switch is not pressed (OFF)
01H	Active ECO switch is pressed (ON)

Receiver of signal and signal features required by the receiver:

EMS, TCU

Note:

This signal is for the Active ECO equipped vehicle only.

##

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Clu_HazardSW	**Hazard Switch Status**	**CLU2**	**0690H**	**49**	**1**

Signal definition:

Information on Hazard Switch On/Off status from Cluster.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0 … 1 = 00 ... 01H

Conversion:

CF_Clu_HazardSW	Function
00H	Hazard switch is “OFF”
01H	Hazard switch is “ON”

Receiver of signal and signal features required by the receiver:

ABS/ESC

Note:

##

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Clu_AliveCnt2	**Alive Counter**	**CLU2**	**0690H**	**50**	**4**

Signal definition:

This signal enables the systems which are using signals from CLUSTER to check whether the CLU2 message is updated or not. The counter has to be increased by 1 after sending of a frame. If the counter reaches 0F, it will restart with 0 at the next frame.
The signal counts up every 100ms.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0 … 15 = 00 ... 0FH

Conversion: (PH) = 1 * (HEX)

Receiver of signal and signal features required by the receiver:

EMS

Note

AFLS Message

Message: AFLS	Identifier: 0650H

Signal label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
Free	Free	0	1	00H	-
AFLS_STAT	AFLS function state	1	2	00H	-
Free	Free	3	5	00H	-

Memory layout:

Free	AFLS_STAT	Free	0

Transmission parameters - Conditions

System	AFLS (Adaptive Front Lighting System)
Output period	100 ms
Output period tolerance	± 20 ms
Latency	max. 20 ms
Remote operation	no
Message Time out	1000ms
Phase relationship to another message	no

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
AFLS_STAT	**AFLS function state**	**AFLS**	**0650H**	**1**	**2**

Signal definition:

This signal indicates AFLS state (whether AFLS is in active state or inactivated) and fault condition. A cluster shall turn on “AFLS OFF” indication lamp in its display panel when this signal is set to “01H”. And if AFLS detects its fault condition then a cluster shall blink “AFLS OFF” indicator in the display panel.

AFLS OFF state is set by swich operation. (“AFLS OFF” switch)

Functional requirements:

Initial value : 00H

Error identifier: -

Physical range : 0 … 3 = 00H .. 03H

Conversion:

AFLS_STAT	Function
00H	AFLS is in normal condition
01H	AFLS Off
02H	Reserved
03H	AFLS is defective

Receiver of signal and signal features required by the receiver:

CLU

Note:

6.2.30 GPC1 Message

Message: GPC1	Identifier: 0610H

Signal label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
GPLG1_STAT	Status of Glow Plug #1	0	4	0FH	0EH
GPLG2_STAT	Status of Glow Plug #2	4	4	0FH	0EH
GPLG3_STAT	Status of Glow Plug #3	8	4	0FH	0EH
GPLG4_STAT	Status of Glow Plug #4	12	4	0FH	0EH
GPLG5_STAT	Status of Glow Plug #5	16	4	0FH	0EH
GPLG6_STAT	Status of Glow Plug #6	20	4	0FH	0EH
Free	Free	24	8	00H	-
GPC_OT_STAT	Glow control unit – Over temperature status	32	2	03H	02H
GPC_UV_STAT	Glow control unit – Under voltage status	34	2	03H	02H
GPC_OV_STAT	Glow control unit – Over voltage status	36	2	03H	02H
Free	Free	38	2	03H	-
GPC_TO_STAT	Glow control unit – CAN message timeout	40	2	03H	02H
Free	Free	42	2	00H	-
GPC_SW_OPEN	Switch defect and open condition	44	2	03H	02H
GPC_SW_COND	Switch defect and conduct condition	46	2	03H	02H
GPCM_CTRL	Current state of the glow plug controller	48	4	0FH	0EH
GPCM_ERROR	Main GPCM error status	52	4	0FH	0EH
Free	Free	56	8	00H	-

Memory layout:

Free				56
GPCM_ERROR		GPCM_CTRL		48
GPC_SW_COND	GPC_SW_OPEN	Free	GPC_TO_STAT	40
Free	GPC_OV_STAT	GPC_UV_STAT	GPC_OT_STAT	32
Free				24
GPC_STAT6		GPC_STAT5		16
GPC_STAT4		GPC_STAT3		8
GPC_STAT2		GPC_STAT1		0

Transmission parameters - Conditions

System	ISS
Output period	100 ms
Output period tolerance	± 20 ms
Latency	max. 20 ms
Transmit condition	Power supply via EMS primary relay
Remote operation	no
Message Time out	1000ms
Message Validity	IGN1
Phase relationship to another message	no

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
GPLG1_STAT	**Status of Glow Plug #1**	**GPC1**	**0610H**	**0**	**4**
GPLG2_STAT	**Status of Glow Plug #2**	**GPC1**	**0610H**	**4**	**4**
GPLG3_STAT	**Status of Glow Plug #3**	**GPC1**	**0610H**	**8**	**4**
GPLG4_STAT	**Status of Glow Plug #4**	**GPC1**	**0610H**	**12**	**4**
GPLG5_STAT	**Status of Glow Plug #5**	**GPC1**	**0610H**	**16**	**4**
GPLG6_STAT	**Status of Glow Plug #6**	**GPC1**	**0610H**	**20**	**4**

Signal definition:

These flags indicate the status of each glow pulg.

Functional requirements:

Initial value : 0FH

Error identifier: 0EH

Physical range : 00H .. 0FH

Conversion:

GPC_STATx	Function
00H	Normal condition (No fault)
01H	Line Open
02H	Short circuit
03H..0DH	Reserved
0EH	Error detected (ECU cannot supply the correct status signal due to internal or external error)
0FH	N/A (ECU has not calculated the signal value so far)

Receiver of signal and signal features required by the receiver:
EMS (Diesel)

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
GPC_OT_STAT	**Glow control unit – Status over temperature**	**GPC1**	**0610H**	**32**	**2**

Signal definition:

This flag indicates that glow plugs are switched off because of high temperature.

Functional requirements:

Initial value : 03H

Error identifier: 02H

Physical range : 00H .. 03H

Conversion:

GPC_OT_STAT	Function
00H	No fault
01H	Fault Active (Glow plugs are switched off)
02H	Signal Error. (ECU cannot supply the correct status signal due to internal or external error)
03H	N/A (ECU has not calculated the signal value so far)

Receiver of signal and signal features required by the receiver:
EMS (Diesel)

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
GPC_UV_STAT	**Glow control unit – Under voltage status**	**GPC1**	**0610H**	**34**	**2**

Signal definition:

This flag indicates that supply voltage is under low limit and glow plug line(s) switch off.

Functional requirements:

Initial value : 03H

Error identifier: 02H

Physical range : 00H .. 03H

Conversion:

GPC_UV_STAT	Function
00H	No fault
01H	Fault Active (Supply voltage is under limit)
02H	Signal Error. (ECU cannot supply the correct status signal due to internal or external error)
03H	N/A (ECU has not calculated the signal value so far)

Receiver of signal and signal features required by the receiver:
EMS (Diesel)

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
GPC_OV_STAT	**Glow control unit – Over voltage status**	**GPC1**	**0610H**	**36**	**2**

Signal definition:

This flag indicates that supply voltage is over high limit and glow plug line(s) switch off.

Functional requirements:

Initial value : 03H

Error identifier: 02H

Physical range : 00H .. 03H

Conversion:

GPC_OV_STAT	Function
00H	No fault
01H	Fault Active (Supply voltage is over limit)
02H	Signal Error. (ECU cannot supply the correct status signal due to internal or external error)
03H	N/A (ECU has not calculated the signal value so far)

Receiver of signal and signal features required by the receiver:
EMS (Diesel)

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
GPC_TO_STAT	**Glow control unit –CAN message timeout**	**GPC1**	**0610H**	**40**	**2**

Signal definition:

This flag indicates that GPCM detected timeout condition of at least one of the relevant CAN message for the GPCM

Functional requirements:

Initial value : 03H

Error identifier: 02H

Physical range : 00H .. 03H

Conversion:

GPC_TO_STAT	Function
00H	No fault
01H	Fault Active (Relevant message timeout)
02H	Signal Error. (ECU cannot supply the correct status signal due to internal or external error)
03H	N/A (ECU has not calculated the signal value so far)

Receiver of signal and signal features required by the receiver:
EMS (Diesel)

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
GPC_SW_OPEN	**Switch defect and open condition**	**GPC1**	**0610H**	**44**	**2**

Signal definition:

At least one power statge does not switch on.

Functional requirements:

Initial value : 03H

Error identifier: 02H

Physical range : 00H .. 03H

Conversion:

GPC_SW_OPEN	Function
00H	No fault
01H	At least one power stage does not switch on
02H	Signal Error. (ECU cannot supply the correct status signal due to internal or external error)
03H	N/A (ECU has not calculated the signal value so far)

Receiver of signal and signal features required by the receiver:
EMS (Diesel)

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
GPC_SW_COND	**Switch defect and conduct condition**	**GPC1**	**0610H**	**46**	**2**

Signal definition:

Functional requirements:

Initial value : 03H

Error identifier: 02H

Physical range : 00H .. 03H

Conversion:

GPC_SW_COND	Function
00H	No fault
01H	Fault
02H	Signal Error. (ECU cannot supply the correct status signal due to internal or external error)
03H	N/A (ECU has not calculated the signal value so far)

Receiver of signal and signal features required by the receiver:
EMS (Diesel)

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
GPCM_CTRL	**Current state of the glow plug controller**	**GPC1**	**0610H**	**48**	**4**

Signal definition:

This flag indicates the state of glow pulg control algorithm.

Functional requirements:

Initial value : 0FH

Error identifier : 0EH

Physical range : 00H .. 0FH

Conversion:

GPCM_CTRL	Function
00H	Glow off – No glow plug is glowing
01H	Engine start glow on (normal operation). At least one glow plug is glowing
02H	Default glowing (Communication to EMS is broken). Glowing is controlled internally.
03H..0DH	Reserved
0EH	Signal Error (ECU cannot supply the correct status signal due to internal or external error)
0FH	N/A (ECU has not calculated the signal value so far)

Receiver of signal and signal features required by the receiver:
EMS (Diesel)

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
GPCM_ERROR	**Main GPCM error status**	**GPC1**	**0610H**	**52**	**4**

Signal definition:

This flag indicates the overall error status. And this signal can be used to test, if GPCM has detected any errors before the detail error status is examined.

Functional requirements:

Initial value : 0FH

Error identifier : 0EH

Physical range : 00H .. 0FH

Conversion:

GPCM_ERROR	Function
00H	No error present in glow system
01H	Error present in glow system. It's a concatenation of all other error status bits. If any error is present in the system, this signal is set.
02H..0DH	Reserved
0EH	Signal Error (ECU cannot supply the correct status signal due to internal or external error)
0FH	N/A (ECU has not calculated the signal value so far)

Receiver of signal and signal features required by the receiver:
EMS (Diesel)

Note:

6.2.31 GST1 Message

Message: GST1	Identifier: 07DFH

Signal Label	Signal designation	Bit add	Bit ind.	Init value	Error ident.
FRM_FORMAT	Functionally requested diagnostic message frame format	0	8	00H	-
SID	Requested service ID	8	8	00H	-
REQ_RESPONSE	Request response of ECUs	16	8	00H	-
Reserved	Reserved signal	24	8	00H	-
Reserved	Reserved signal	32	8	00H	-
Reserved	Reserved signal	40	8	00H	-
Reserved	Reserved signal	48	8	00H	-
Reserved	Reserved signal	56	8	00H	-

Memory layout:

Reserved	56
Reserved	48
Reserved	40
Reserved	32
Reserved	24
REQ_RESPONSE	16
SID	8
FRM_FORMAT	0

Transmission parameters - Conditions

Message	GST1
System	TESTER
Output period	Event Driven
Output period tolerance	N/A
Latency	N/A
Remote operation	no
Receive ready after Power Up	≤ 250 ms
Ready to transmit after Power Up	N/A
Message Time out	N/A
Message Validity	IGN1
Phase relationship to another message	no

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
FRM_FORMAT	**Functionally requested diagnostic message frame format**	**GST1**	**07DFH**	**0**	**8**

Signal definition:

This signal indicates the frame format of functionally requested diagnostic message. The identifier of this message is pre-defined in ISO 15765-4 (Diagnostics on CAN – Part4: Requirements for emissions-related systems). The purpose of this message is that a tester(GST or manufacturer dependent test tool) request a diagnostic service by functionally addressed CAN-ID and all systems which are connected to the same CAN bus can repond to the tester.

The message configured as following table.

	Byte 1		Byte 2	Byte 3	Byte 4 – Byte 7	Byte 8
Single Frame	0x00	Lenth	DATA 1	DATA 2	...	DATA 7
First Frame	0x01	Length		DATA 1	...	DATA 6

FRM_FORMAT is the first byte of above table. If the first 4 nibble of 1st byte is 0x00 then it indicates that the message is single frame. In this specification only single frame format message which has 3bytes data shall be considered and other format message can be ignored *).

The definition of each byte of this meesage which should be considered is :

- Byte 1 : FRM_FORMAT and Length = 2.
- Byte 2 : SID, i.e. DATA1 = Requested service ID (see next page)
- Byte 3 : REQ_RESPONSE, i.e. DATA2 = Request response of ECUs (see the page after next page)

All ECU should analyze this signal and if the value is 0x02 then also must analyze next two signals and should react to the requested service.

Phase relationship:

This signal has a relationship with SID and REQ_RESPONSE.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 01 ... 1FH

Conversion:

FRM_FORMAT	Function
0x02	Single frame and should analyze next two data of this message
Others	Can be Ignored *)

Receiver of signal and signal features required by the receiver:

All ECUs

Note:

*) If an ECU has diagnostic communication on CAN service functionallty and communicate with an tester via CAN then must consider other message format. (DO NOT IGNORE OTHER CASES!)

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
SID	**Requested service ID**	**GST1**	**07DFH**	**8**	**8**

Signal definition:

This signal indicates the service ID that a kind of diagnostic services requesed by a tester to be done by ECUs.

If SID value is 0x28 (DisableNormalMessageTransmission service) then the normal CAN communication between all ECUs should be stop except diagnostic communication on CAN. This means that a tester can request “disable normal communication” service and all ECUs must stop transmission of its messages and also must disable the “Communication time out” function.

And if SID value is 0x29 (EnableNormalMessageTransmission service) then all ECUs can resume its transmission of normal CAN messages and enable the “Communication time out” function.

Other SID can be ignored*)

Phase relationship:
This signal has a relationship with FRM_FORMAT and REQ_RESPONSE.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... FFH

Conversion:

SID	Function
0x28	Disable transmission of normal CAN messages. (Stop normal CAN communication)
0x29	Enable transmission of normal CAN messages. (Resume normal CAN communication)
Others	Can be Ignored

Receiver of signal and signal features required by the receiver:
All ECUs

Note:
*) If an ECU has diagnostic communication on CAN service functionallty and communicate with an tester via CAN then must consider other services. (DO NOT IGNORE OTHER CASES !)

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
REQ_RESPONSE	**Request response of ECUs**	**GST1**	**07DFH**	**16**	**8**

Signal definition:

This signal indicates that a response from ECUs after service request of a tester is required or not.

If responses from ECUs are required this value will be set to 1 and are not required this value set to 0. If this value is set to 1 then the addressed ECUs should respond with a positive or a negative response message.

※ If FRM_FORMAT=0x02, SID = 0x28 or 0x29 (Disable/Enable normal CAN communication) and REQ_RESPONSE=1 then EMS, TCU and ECUs which support the diagnostic communication on CAN shall respond with a positive/negative response message. And for other ECUs which do not support the diagnostic communication on CAN it is not necessary to respond even though REQ_RESPONSE is set to "1".

Phase relationship:

This signal has a relationship with SID and FRM_FORMAT.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 02H

Conversion:

REQ_RESPONSE	Function
0x00	Reserved
0x01	Response required
0x02	No response required

Receiver of signal and signal features required by the receiver:

All ECUs

Note:

6.2.32 EngFrzFrm1 Message

Message: EngFrzFrm1	Identifier: 00A0H

Signal Label	Signal designation	Bit add	Bit ind.	Init value	Error ident.
PID_04h	Freeze Frame - Calculated LOAD value	0	8	00H	-
PID_05h	Freeze Frame - Engine coolant temperature	8	8	00H	-
PID_0Ch	Freeze Frame - Engine RPM	16	16	0000H	-
PID_0Dh	Freeze Frame - Vehicle speed sensor	32	8	00H	-
PID_11h	Freeze Frame - Absolute throttle position	40	8	00H	-
PID_03h	Freeze Frame – Fuel Control System Status	48	16	0000H	-

Memory layout:

PID_03h (MSB)	56
PID_03h (LSB)	48
PID_11h	40
PID_0Dh	32
PID_0Ch (MSB)	24
PID_0Ch (LSB)	16
PID_05h	8
PID_04h	0

Transmission parameters - Conditions

Message	EngFrzFrm1
System	EMS
Output period	10 ms
Output period tolerance	± 5 ms
Latency	max. 5ms
Remote operation	no
Message Time out	N/A
Message Validity	IGN1
Phase relationship to another message	no

※ **See next page for the purpose and description of this message**.

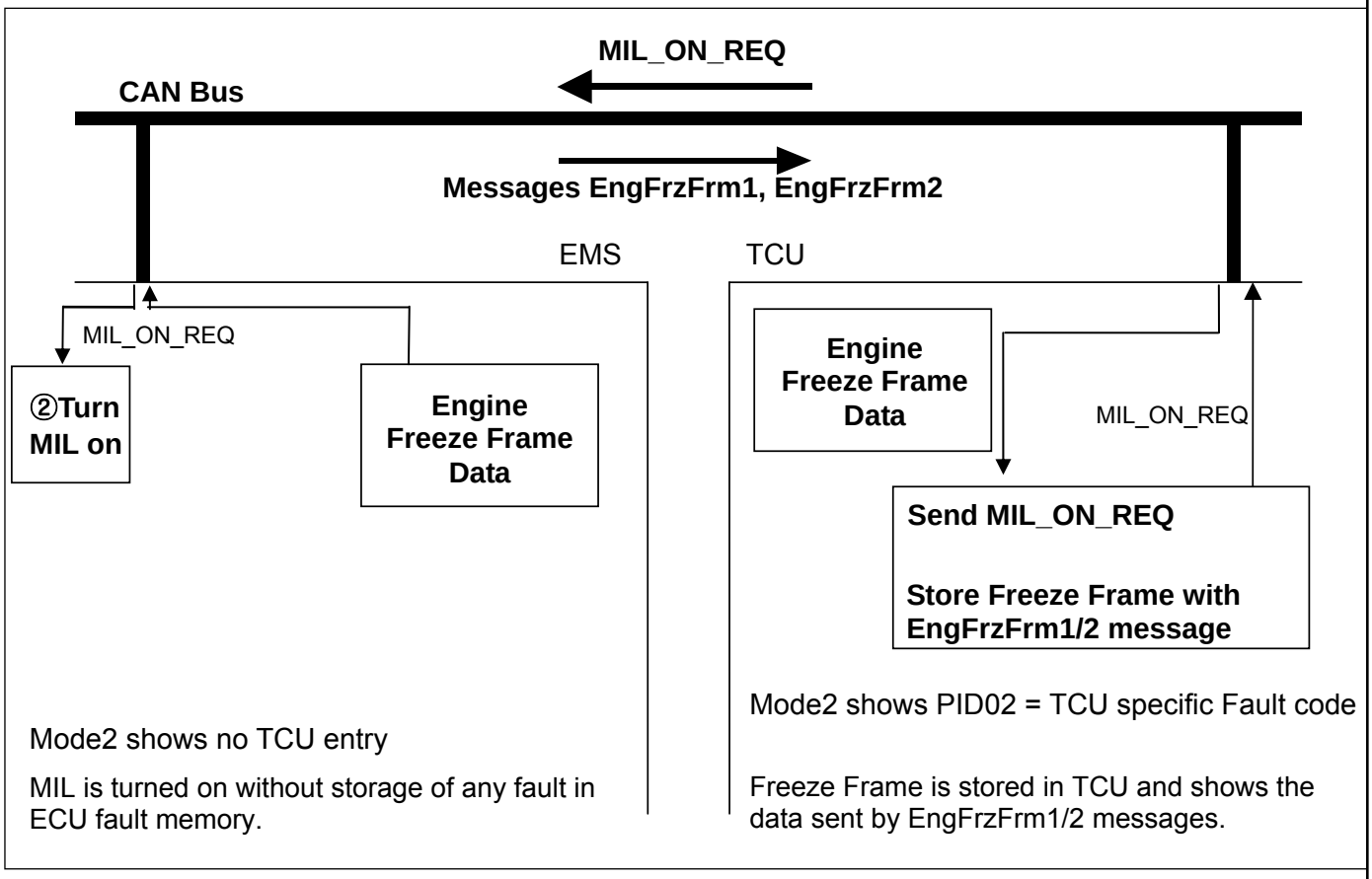
Background :

According to the CARB regulation, only an ECU which detects an OBD fault, requires the EMS to store a set of environmental conditions (freeze frame). But it's regulation is changed so that an TCU have to store a set of environmental conditions (freeze frame).

Overview :

A TCU sends MIL-ON-Request to an EMS with "TCU_OBD" signal in TCU1 message (Bit2-MIL On Req.) The EMS turns on Mil on the MIL-ON-Request. The EMS sends all information necessary (EngFrzFrm1, EngFrzFrm2) over CAN every 10msec and the TCU can store the Freeze Frame on MIL-ON request with the actual data.

Description :



LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
PID_04h	**Freeze Frame - Calculated LOAD value**	**EngFrzFrm1**	**00A0H**	**0**	**8**

Signal definition:

PID_04H : Parameter ID for CARB OBD regulation – SAE J1979 Service Mode 02

The following definition, although a little more restrictive, will standardise and improve the accuracy the calculation.

Calculated LOAD value = [current airflow] / [(peak airflow at WOT@STP as a function of rpm) * (BARO/29.92) * SQRT(298/(AAT+273))]

Where : WOT = Wide Open Throttle
STP = Standard Temperature and Pressure ; 25 °C, 29.92 Hg BARO
SQRT = Square Root
AAT = Ambient Air Temperature (°C)

Characteristics of Calculated LOAD value are:
- Reaches 1.0 at WOT at any altitude, temperature or rpm for both naturally aspirated and boosted engines.
- Indicates percent of peak available torque.
- Linearly correlated with engine vacuum
- Often used to schedule power enrichment.

Diesel system shall support this PID using fuel flow in place of airflow for the above calculations.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0 … 100 % = 00H .. FFH

Conversion: (PH) = (100/255) * (HEX) [%]

Receiver of signal and signal features required by the receiver:

TCU

Note:

See PID 43h of SAE J1979 for an additional definition of engine load

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
PID_05h	**Freeze Frame - Engine coolant temperature**	**EngFrzFrm1**	**00A0H**	**8**	**8**

Signal definition:

PID_05H : Parameter ID for CARB OBD regulation – SAE J1979 Service Mode 02

PID_05H (Engine Coolant Temperature) shall display engine coolant temperature derived from an engine coolant temperature sensor or a cylinder head temperature sensor.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: -40...+215°C = 00H .. FFH

Conversion: (PH) = 1 * (HEX) - 40 [°C]

Receiver of signal and signal features required by the receiver:

TCU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
PID_0Ch	**Freeze Frame - Engine RPM**	**EngFrzFrm1**	**00A0H**	**16**	**16**

Signal definition:

PID_0CH : Parameter ID for CARB OBD regulation – SAE J1979 Service Mode 02

This signal indicates engine speed (RPM-Revolution per Min.) and compatible with signal “N” in EMS1 message.

Functional requirements:

Initial value: 0000H

Error identifier: -

Physical range: 0 .. 16383.75 rpm = 0000H .. FFFFH

Conversion: (PH) = 0.25 * (HEX) [rpm]

Receiver of signal and signal features required by the receiver:

TCU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
PID_0Dh	**Freeze Frame - Vehicle speed sensor**	**EngFrzFrm1**	**00A0H**	**32**	**8**

Signal definition:

PID_0DH : Parameter ID for CARB OBD regulation – SAE J1979 Service Mode 02

PID_0DH (Vehicle Speed Sensor) shall display vehicle road speed, if utilised by the control module strategy. Vehicle speed may be derived from a vehicle speed sensor, calculated by the EMS using other speed sensors, or obtained from the vehicle serial data communication bus.(e.g. ABS/TCS/ESC)

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0 ... 255 km/h = 00H.. FFH

Conversion: (PH) = 1 * (HEX) [km/h]

Receiver of signal and signal features required by the receiver:

TCU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
PID_11h	**Freeze Frame - Absolute Throttle Position**	**EngFrzFrm1**	**00A0H**	**40**	**8**

Signal definition:

PID_11H : Parameter ID for CARB OBD regulation – SAE J1979 Service Mode 02

Absolute throttle position (not “relative” or “learned” throttle position) shall be displayed as a normalised value, scaled from 0 to 100%.

For example, if a 0 to 5.0 volt sensor is used (uses a 5.0 volt reference voltage), and the closed throttle position is a 1.0 volts, it shall display (1.0 / 5.0) = 20% at closed throttle and 50% at 2.5 volts. Throttle position at idle will usually indicate greater than 0%, and throttle position at wide open throttle will usually indicate less than 100%.

For systems where the output is proportional to the input voltage, this value is the percent of maximum input reference voltage. For systems where the output is inversely proportional to the input voltage, this value is 100% minus the percent of maximum input reference voltage.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0 … 100 % = 00H .. FFH

Conversion: (PH) = (100/255) * (HEX) [%]

Receiver of signal and signal features required by the receiver:

TCU

Note:

See PID 45h of SAE J1979 for a definition of Relative Throttle Position

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
PID_03h	**Freeze Frame - Fuel Control System Status**	**EngFrzFrm1**	**00A0H**	**48**	**16**

Signal definition:

PID_03H : Parameter ID for Domestic KOBD regulation – SAE J1979 Service Mode 02.

PID_03H (Fuel system status) shows the fuel control status.

Functional requirements:

Initial value: 0000H

Error identifier: -

Physical range: -

Conversion:

Fuel system	Data byte	Bit	Status Description	Remark
Fuel system1 status	A	0	1 = Open loop - has not yet satisfied conditions to go closed loop	Open Loop
		1	1 = Closed loop - using oxygen sensor(s) as feedback for fuel control	Close Loop
		2	1 = Open loop due to driving conditions (e.g., power enrichment, deceleration enleanment)	Open Loop drive
		3	1 = Open loop - due to detected system fault	Open Loop Fault
		4	1 = Closed loop, but fault with at least one oxygen sensor may be using single oxygen sensor for fuel control	Close Loop Fault
		5~7	reserved (bits shall be reported as ‘0’)	----
Fuel system2 status	B	0	1 = Open loop - has not yet satisfied conditions to go closed loop	Open Loop
		1	1 = Closed loop - using oxygen sensor(s) as feedback for fuel control	Close Loop
		2	1 = Open loop due to driving conditions (e.g., power enrichment, deceleration enleanment)	Open Loop drive
		3	1 = Open loop - due to detected system fault	Open Loop Fault
		4	1 = Closed loop, but fault with at least one oxygen sensor may be using single oxygen sensor for fuel control	Close Loop Fault
		5~7	reserved (bits shall be reported as ‘0’)	----

Receiver of signal and signal features required by the receiver:
TCU

Note:

Fuel systems do not normally refer to injector banks. Fuel systems are intended to represent completely different fuel systems that can independently enter and exit closed loop fuel. Banks of injectors on a V-engine are generally not independent and share the same closed-loop enablement criteria.

6.2.33 EngFrzFrm2 Message

Message: EngFrzFrm2	Identifier: 00A1H

Signal Label	Signal designation	Bit add	Bit ind.	Init value	Error ident.
PID_06h	Freeze Frame – Short Term Fuel Trim Bank1	0	8	80H	-
PID_07h	Freeze Frame – Long Term Fuel Trim Bank1	8	8	80H	-
PID_08h	Freeze Frame – Short Term Fuel Trim Bank2	16	8	80H	-
PID_09h	Freeze Frame – Long Term Fuel Trim Bank2	24	8	80H	-
PID_0Bh	Freeze Frame - Manifold Absolute Pressure	32	8	00H	-
PID_23h	Freeze Frame – Fuel Pressure	40	16	0000H	-
Free	Free	56	8	00H	-

Memory layout:

Free	56
PID_23h (MSB)	48
PID_23h (LSB)	40
PID_0Bh	32
PID_09h	24
PID_08h	16
PID_07h	8
PID_06h	0

Transmission parameters - Conditions

Message	EngFrzFrm2
System	EMS
Output period	10 ms
Output period tolerance	± 5 ms
Latency	max. 5ms
Remote operation	no
Message Time out	N/A
Message Validity	IGN1
Phase relationship to another message	no

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
PID_06h	**Freeze Frame – Short Term Fuel Trim Bank1**	**EngFrzFrm2**	**00A1H**	**0**	**8**

Signal definition:

PID_06H_A : Parameter ID for Domestic KOBD regulation – SAE J1979 Service Mode 02.

PID_06H_A (Short Term Fuel Trim - Bank 1) shall indicate the correction being utilized by the closed loop fuel algorithm. If the fuel system is in open loop, PID_06H_A shall report 0% correction.

Functional requirements:

Initial value: 80H

Error identifier: -

Physical range: -100 … 99.22 % = 00H .. FFH

Conversion: (PH) = (100/128) * (HEX) - 100 [%]

Receiver of signal and signal features required by the receiver:

TCU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
PID_07h	**Freeze Frame – Long Term Fuel Trim Bank1**	**EngFrzFrm2**	**00A1H**	**8**	**8**

Signal definition:

PID_07H_A : Parameter ID for Domestic KOBD regulation – SAE J1979 Service Mode 02.

PID_07H_A (Long Term Fuel Trim - Bank 1) stored in Non-volatile RAM or Keep-alive RAM. PID_07H_A shall indicate the correction being utilized by the fuel control algorithm at the time the data is requested, in both open loop and closed loop fuel control. If no correction is utilized in open loop fuel, PID_07H_A shall report 0% correction. If long-term fuel trim is not utilized at all by the fuel control algorithm, the PID shall not be supported.

Functional requirements:

Initial value: 80H

Error identifier: -

Physical range: -100 … 99.22 % = 00H .. FFH

Conversion: (PH) = (100/128) * (HEX) - 100 [%]

Receiver of signal and signal features required by the receiver:

TCU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
PID_08h	**Freeze Frame – Short Term Fuel Trim Bank2**	**EngFrzFrm2**	**00A1H**	**16**	**8**

Signal definition:

PID_08H_A : Parameter ID for Domestic KOBD regulation – SAE J1979 Service Mode 02.

PID_08H_A (Short Term Fuel Trim - Bank 2) shall indicate the correction being utilized by the closed loop fuel algorithm. If the fuel system is in open loop, PID_08H_A shall report 0% correction.

Functional requirements:

Initial value: 80H

Error identifier: -

Physical range: -100 … 99.22 % = 00H .. FFH

Conversion: (PH) = (100/128) * (HEX) - 100 [%]

Receiver of signal and signal features required by the receiver:

TCU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
PID_09h	**Freeze Frame – Long Term Fuel Trim Bank2**	**EngFrzFrm2**	**00A1H**	**24**	**8**

Signal definition:

PID_09H_A : Parameter ID for Domestic KOBD regulation – SAE J1979 Service Mode 02.

PID_09H_A (Long Term Fuel Trim - Bank 2) stored in Non-volatile RAM or Keep-alive RAM. PID_09H_A shall indicate the correction being utilized by the fuel control algorithm at the time the data is requested, in both open loop and closed loop fuel control. If no correction is utilized in open loop fuel, PID_09H_A shall report 0% correction. If long-term fuel trim is not utilized at all by the fuel control algorithm, the PID shall not be supported.

Functional requirements:

Initial value: 80H

Error identifier: -

Physical range: -100 … 99.22 % = 00H .. FFH

Conversion: (PH) = (100/128) * (HEX) - 100 [%]

Receiver of signal and signal features required by the receiver:

TCU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
PID_0Bh	**Freeze Frame – Manifold Absolute Pressure**	**EngFrzFrm2**	**00A1H**	**32**	**8**

Signal definition:

PID_0BH : Parameter ID for Domestic KOBD regulation – SAE J1979 Service Mode 02.

PID_0BH (Intake Manifold Absolute Pressure) shall display manifold pressure derived form a Manifold Absolute Pressure sensor, if a sensor is utilized.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0 … 255 kPa = 00H .. FFH

Conversion: (PH) = 1 * (HEX) [kPa]

Receiver of signal and signal features required by the receiver:

TCU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
PID_23h	**Freeze Frame – Fuel Pressure**	**EngFrzFrm2**	**00A1H**	**40**	**16**

Signal definition:

PID_23H : Parameter ID for Domestic KOBD regulation – SAE J1979 Service Mode 02.

PID_23H (Fuel Rail Pressure) shall display fuel rail pressure at the engine when the reading is referenced to atmosphere(gage pressure).
This is for only diesel fuel pressure and gasoline direct injection system.

Functional requirements:

Initial value: 0000H

Error identifier: -

Physical range: 0 … 655350 kPa = 0000H .. FFFFH

Conversion: (PH) = 10 * (HEX) [kPa]

Receiver of signal and signal features required by the receiver:

TCU

Note:

6.2.34 TPMS1 Message

Message: TPMS1	Identifier: 05F0H

Signal Label	Signal designation	Bit add	Bit ind.	Init value	Error ident.
TPMS_W_LAMP	TPMS Malfunction Warning lamp	0	2	00H	-
TREAD_W_LAMP	TREAD Warning lamp	2	2	00H	-
POS_FL_W_LAMP	FL POSITION Warning lamp	4	1	00H	-
POS_FR_W_LAMP	FR POSITION Warning lamp	5	1	00H	-
POS_RL_W_LAMP	RL POSITION Warning lamp	6	1	00H	-
POS_RR_W_LAMP	RR POSITION Warning lamp	7	1	00H	-
Free	Free	8	8	00H	-

Memory layout:

Free						8
POS_RR_W_LAMP	POS_RL_W_LAMP	POS_FR_W_LAMP	POS_FL_W_LAMP	TREAD_W_LAMP	TPMS_WLAMP	0

Transmission parameters - Conditions

Message	TPMS1
System	TPMS
Output period	50 ms
Output period tolerance	± 6 ms
Latency	max. 10ms
Remote operation	no
Message Time out	500ms
Message Validity	IGN1
Phase relationship to another message	no

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
TPMS_W_LAMP	**TPMS Malfunction Warning lamp**	**TPMS1**	**05F0H**	**0**	**2**

Signal definition:

The signal indicates the status of the “TPMS Malfunction Warning lamp”

Functional requirements:

Initial value: 00H

Error identifier: -

Physical Range: 00..03H

Conversion:

TPMS_W_LAMP	Function
00H	TPMS Malfunction Warning lamp OFF
01H	TPMS Malfunction Warning lamp ON
02H	TPMS Malfunction Warning lamp BLINKING(2Hz)
03H	Reserved

Receiver of signal and signal features required by the receiver:
CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
TREAD_W_LAMP	**TREAD Warning lamp**	**TPMS1**	**05F0H**	**2**	**2**

Signal definition:

The signal indicates the status of the “TREAD Warning lamp”

Functional requirements:

Initial value: 00H

Error identifier: -

Physical Range: 00..03H

Conversion:

TREAD_W_LAMP	Function
00H	TREAD Warning lamp OFF
01H	TREAD Warning lamp ON
02H	TREAD Warning lamp BLINKING(2Hz)
03H	Reserved

Receiver of signal and signal features required by the receiver:
CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
POS_FL_W_LAMP	**FL POSITION Warning lamp**	**TPMS1**	**05F0H**	**4**	**1**

Signal definition:

The signal indicates the status of the “FL POSITION Warning lamp”

Functional requirements:

Initial value: 00H

Error identifier: -

Physical Range: 00..01H

Conversion:

POS_FL_W_LAMP	Function
00H	FL POSITION Warning lamp OFF
01H	FL POSITION Warning lamp ON

Receiver of signal and signal features required by the receiver:
CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
POS_FR_W_LAMP	**FR POSITION Warning lamp**	**TPMS1**	**05F0H**	**5**	**1**

Signal definition:

The signal indicates the status of the “FR POSITION Warning lamp”

Functional requirements:

Initial value: 00H

Error identifier: -

Physical Range: 00..01H

Conversion:

POS_FR_W_LAMP	Function
00H	FR POSITION Warning lamp OFF
01H	FR POSITION Warning lamp ON

Receiver of signal and signal features required by the receiver:
CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
POS_RL_W_LAMP	**RL POSITION Warning lamp**	**TPMS1**	**05F0H**	**6**	**1**

Signal definition:

The signal indicates the status of the “RL POSITION Warning lamp”

Functional requirements:

Initial value: 00H

Error identifier: -

Physical Range: 00..01H

Conversion:

POS_RL_W_LAMP	Function
00H	RL POSITION Warning lamp OFF
01H	RL POSITION Warning lamp ON

Receiver of signal and signal features required by the receiver:
CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
POS_RR_W_LAMP	**RR POSITION Warning lamp**	**TPMS1**	**05F0H**	**7**	**1**

Signal definition:

The signal indicates the status of the “RR POSITION Warning lamp”

Functional requirements:

Initial value: 00H

Error identifier: -

Physical Range: 00..01H

Conversion:

POS_RR_W_LAMP	Function
00H	RR POSITION Warning lamp OFF
01H	RR POSITION Warning lamp ON

Receiver of signal and signal features required by the receiver:
CLU

Note:

6.2.35 REA1 Message

Message: REA1	Identifier: 0183H

Signal Label	Signal designation	Bit add	Bit ind.	Init value	Error ident.
CF_EndBst_PwmDuH	Error- VGT actuator PWM input duty too high	0	1	00H	-
CF_EndBst_PwmDuL	Error- VGT actuator PWM input duty too low	1	1	00H	-
CF_EndBst_PwmFqOutRng	Error- VGT actuator PWM input frequency out of range	2	1	00H	-
CF_EndBst_HbriOverCur	Error- VGT actuator H-bridge over-current	3	1	00H	-
CF_EndBst_HbriOverTemp	Error- VGT actuator H-bridge over-temperature	4	1	00H	-
Free	Free	5	1	00H	-
CF_EndBst_PosSnsKOR	Error- VGT actuator position sensor gain out of range	6	1	00H	-
CF_EndBst_PosSnsOSOR	Error- VGT actuator position sensor offset in out of range	7	1	00H	-
CF_EndBst_EepFlt	Error- VGT actuator EEPROM	8	1	00H	-
CF_EndBst_RomFlt	Error- VGT actuator ROM	9	1	00H	-
CF_EndBst_RamFlt	Error- VGT actuator RAM	10	1	00H	-
CF_EndBst_CanFlt	Error- VGT actuator CAN communication	11	1	00H	-
CF_EndBst_AgH	Error- VGT actuator angle too high	12	1	00H	-
CF_EndBst_AgL	Error- VGT actuator angle too low	13	1	00H	-
CF_EndBst_ORVol	Error- VGT actuator supply voltage out of range	14	1	00H	-
Free	Free	15	1	00H	-
CR_EndBst_ActPos	VGT actuator actual position	16	16	0000H	03FFH
CR_EndBst_DemPos	VGT actuator demand position	32	16	0000H	-
CR_EndBst_HbriPwr	VGT actuator h-bridge output power	48	16	0000H	-

Memory layout:

CR_EndBst_HbriPwr (MSB)								56
CR_EndBst_HbriPwr (LSB)								48
CR_EndBst_DemPos (MSB)								40
CR_EndBst_DemPos (LSB)								32
CR_EndBst_ActPos (MSB)								24
CR_EndBst_ActPos (LSB)								16
Free	CF_EndBst_ORVol	CF_EndBst_AgL	CF_EndBst_AgH	CF_EndBst_CanFlt	CF_EndBst_RamFlt	CF_EndBst_RomFlt	CF_EndBst_EepFlt	8
CF_EndBst_PosSnsOSOR	CF_EndBst_PosSnsKOR	Free	CF_EndBst_HbriOverTemp	CF_EndBst_HbriOverCur	CF_EndBst_PwmFqOutRng	CF_EndBst_PwmDuL	CF_EndBst_PwmDuH	0

Transmission parameters - Conditions

Message	REA1
System	REA
Output period	10 ms
Output period tolerance	± 5 ms
Latency	max. 5ms
Remote operation	no
Message Time out	500ms
Message Validity	IGN1
Phase relationship to another message	no

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_EndBst _PwmDuH	**Error- VGT actuator PWM input duty too high**	**REA1**	**0183H**	**0**	**1**

Signal definition:

The signal indicates that PWM input command duty cycle too high (>=97%)

Functional requirements:

Initial value: 00H

Error identifier: -

Physical Range: 00..01H

Conversion:

Value	Function
00H	No Error
01H	Error

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_EndBst _PwmDuL	**Error- VGT actuator PWM input duty too low**	**REA1**	**0183H**	**1**	**1**

Signal definition:

The signal indicates that PWM input command duty cycle too low (<=3%)

Functional requirements:

Initial value: 00H

Error identifier: -

Physical Range: 00..01H

Conversion:

Value	Function
00H	No Error
01H	Error

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_EndBst_PwmFqOutRng	**Error- VGT actuator PWM input frequency out of range**	**REA1**	**0183H**	**2**	**1**

Signal definition:

The signal indicates that PWM input command duty cycle frequency out of spec.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical Range: 00..01H

Conversion:

Value	Function
00H	No Error
01H	Error

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_EndBst_HbriOverCur	**Error- VGT actuator H-bridge over-current**	**REA1**	**0183H**	**3**	**1**

Signal definition:

The signal indicates that Asic H-Bridge current consumption too high. (> 8+/- 2A)

Functional requirements:

Initial value: 00H

Error identifier: -

Physical Range: 00..01H

Conversion:

Value	Function
00H	No Error
01H	Error

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_EndBst_HbriOverTemp	**Error- VGT actuator H-bridge over- temperature**	**REA1**	**0183H**	**4**	**1**

Signal definition:

The signal indicates that Asic temperature too high.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical Range: 00..01H

Conversion:

Value	Function
00H	No Error
01H	Error

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_EndBst_PosSnsKOR	**Error- VGT actuator position sensor gain out of range**	**REA1**	**0183H**	**6**	**1**

Signal definition:

The signal indicates that Position sensor gain out of range.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical Range: 00..01H

Conversion:

Value	Function
00H	No Error
01H	Error

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_EndBst_PosSnsOSOR	**Error- VGT actuator position sensor offset in out of range**	**REA1**	**0183H**	**7**	**1**

Signal definition:

The signal indicates that Position sensor offset out of range.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical Range: 00..01H

Conversion:

Value	Function
00H	No Error
01H	Error

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_EndBst _EepFlt	**Error- VGT actuator EEPROM**	**REA1**	**0183H**	**8**	**1**

Signal definition:

The signal indicates that EEPROM failure.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical Range: 00..01H

Conversion:

Value	Function
00H	No Error
01H	Error

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_EndBst _RomFlt	**Error- VGT actuator ROM**	**REA1**	**0183H**	**9**	**1**

Signal definition:

The signal indicates that ROM failure.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical Range: 00..01H

Conversion:

Value	Function
00H	No Error
01H	Error

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_EndBst _RamFlt	**Error- VGT actuator RAM**	**REA1**	**0183H**	**10**	**1**

Signal definition:

The signal indicates that RAM failure.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical Range: 00..01H

Conversion:

Value	Function
00H	No Error
01H	Error

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_EndBst _CanFlt	**Error- VGT actuator CAN communication**	**REA1**	**0183H**	**11**	**1**

Signal definition:

The signal indicates that CAN communication error.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical Range: 00..01H

Conversion:

Value	Function
00H	No Error
01H	Error

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_EndBst_AgH	**Error- VGT actuator angle too high**	**REA1**	**0183H**	**12**	**1**

Signal definition:

The signal indicates that REA can't reach position in CCW mode.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical Range: 00..01H

Conversion:

Value	Function
00H	No Error
01H	Error

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_EndBst_AgL	**Error- VGT actuator angle too low**	**REA1**	**0183H**	**13**	**1**

Signal definition:

The signal indicates that REA can't reach position in CW mode.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical Range: 00..01H

Conversion:

Value	Function
00H	No Error
01H	Error

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_EndBst_ORVol	**Error- VGT actuator supply voltage out of range**	**REA1**	**0183H**	**14**	**1**

Signal definition:

The signal indicates that REA supply voltage out of range (<7.85V or >16V).

Functional requirements:

Initial value: 00H

Error identifier: -

Physical Range: 00..01H

Conversion:

Value	Function
00H	No Error
01H	Error

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_EndBst_ActPos	**VGT actuator actual position**	**REA1**	**0183H**	**16**	**16**

Signal definition:

The signal indicates that REA absolute shaft position.

Functional requirements:

Initial value: 0000H

Error identifier: 03FFH

Physical range: 1.989 ... 118.053° = 0011H ... 03F1H

Conversion: (PH) = 0.117 * (HEX) [°]

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_EndBst_DemPos	**VGT actuator demand position**	**REA1**	**0183H**	**32**	**16**

Signal definition:

The signal indicates that REA requested shaft position.

Functional requirements:

Initial value: 0000H

Error identifier: -

Physical range: 0 ... 119.691° = 0000H ... 03FFH

Conversion: (PH) = 0.117 * (HEX) [°]

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_EndBst_HbriPwr	**VGT actuator H-bridge output power**	**REA1**	**0183H**	**48**	**16**

Signal definition:

The signal indicates that REA motor power.

Functional requirements:

Initial value: 0000H

Error identifier: -

Physical range: 0 ... 99.99% = 0000H ... 08AEH

Conversion: (PH) = 0.045 * (HEX) [%]

Receiver of signal and signal features required by the receiver:

EMS

Note:

6.2.36 ECS1 Message

Message: ECS1	Identifier: 05E0h

Signal Label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
ECS_W_lamp	Warning lamp	0	1	00H	-
SYS_NA	System temporary not available	1	1	00H	-
ECS_DEF	Indicates ECS error state	2	1	00H	-
ECS_DIAG	Indicates ECS is in diagnosis state	3	1	00H	-
L_CHG_NA	Height level change is not available	4	1	00H	-
Free	Free	5	3	00H	-
Lifting	Lift up to higher level	8	1	00H	-
Lowering	Lower down to lower level	9	1	-	-
Damping_Mode	Actual damping mode	10	2	-	-
REQ_Damping	Requested damping mode by ECS switch	12	2	00H	-
REQ_Height	Requested height by ECS Switch	14	2	00H	-
REQ_level	Requested level by ECS switch or automatic	16	4	00H	-
ACT_Height	Actual level of a vehicle	20	4	-	-
Free	Free	24	8	00H	-
Free	Free	32	8	00H	-

Memory layout:

Free						32
Free						24
ACT_Height		REQ_Level				16
REQ_Height	REQ_Damping	Damping_Mode		Lowering	Lifting	8
Free	L_CHG_NA	ECS_DIAG	ECS_DEF	SYS_NA	ECS_W_Lamp	0

Transmission parameters - Conditions

System	ECS
Output period	50 ms
Output period tolerance	± 6ms
Latency	Max. 10ms
Remote operation	no
Message Time out	1s
Message Validity	IGN1
Phase relationship to another message	no

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ECS_W_LAMP	**ECS Warning lamp**	**ECS1**	**05E0h**	**0**	**1**

Signal definition:

ECS_W_LAMP:
The signal indicates the status of the “ECS warning lamp”

Functional requirements:

Initial value: 00H

Error identifier: -

Range: 00 ... 01H

Conversion:

ECS_W_LAMP	Function
00H	Off
01H	On

Receiver of signal and signal features required by the receiver:

CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
SYS_NA	**System temporary not available**	**ECS1**	**05E0h**	**1**	**1**

Signal definition:

SYS_NA:
System temporary not available because of over-heat, no enough air, etc.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H ... 01H

Conversion:

SYS_NA	Function
00H	System available
01H	System temporary not available

Receiver of signal and signal features required by the receiver:

CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ECS_DEF	**Indicates ECS error state**	**ECS1**	**05E0h**	**2**	**1**

Signal definition:

ECS_DEF:
Information regarding the ECS “defective” indication

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H ... 01H

Conversion:

ECS_DEF	Function
00H	ECS is not defective
01H	ECS is defective

Receiver of signal and signal features required by the receiver:

CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ECS_DIAG	**indicates ECS is in diagnosis state**	**ECS1**	**05E0h**	**3**	**1**

Signal definition:

ECS_DIAG:
Information regarding the ECS “diagnosis states” indication

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H ... 01H

Conversion:

ECS_DIAG	Function
00H	ECS is not diagnosis states
01H	ECS is diagnosis states

Receiver of signal and signal features required by the receiver:

CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
L_CHG_NA	**Level change is not available**	**ECS1**	**05E0h**	**4**	**1**

Signal definition:

L_CHG_NA:
Height level change by ECS switch is not available
This signal will be set after a manual level/damping request by the driver only for one loop

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H ... 01H

Conversion:

L_CHG_NA	Function
00H	-
01H	Height level change not available

Receiver of signal and signal features required by the receiver:

CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
Lifting	**Lift up to higher level**	**ECS1**	**05E0h**	**8**	**1**

Signal definition:

Lifting:
ECS is raising a vehicle to a higher level.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H ... 01H

Conversion:

Lifting	Function
00H	no change of level
01H	raising

Receiver of signal and signal features required by the receiver:

CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
Lowering	**Lower down to lower level**	**ECS1**	**05E0h**	**9**	**1**

Signal definition:

Lowering:
ECS is lowering a vehicle to a lower level.

Functional requirements:

Initial value: -

Error identifier: -

Physical range: 00H ... 01H

Conversion:

Lowering	Function
00H	no change of level
01H	lowering

Receiver of signal and signal features required by the receiver:

CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
Damping_Mode	**Actual damping mode**	**ECS1**	**05E0h**	**10**	**2**

Signal definition:

Damping_Mode:
The actual damping mode of an ECS system

Functional requirements:

Initial value: -

Error identifier: -

Physical range: 00H ... 03H

Conversion:

Damping_Mode	Function
00H	Auto
01H	Soft
02H	Hard
03H	Reserved

Receiver of signal and signal features required by the receiver:

CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
REQ_Damping	**Requested damping mode**	**ECS1**	**05E0h**	**12**	**2**

Signal definition:

REQ_Damping:
Requested damping mode set by ECS manual switch

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H ... 03H

Conversion:

REQ_Damping	Function
00H	Auto
01H	Soft
02H	Hard
03H	Reserved

Receiver of signal and signal features required by the receiver:

CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
REQ_Height	**Requested level by ECS switch**	**ECS1**	**05E0h**	**14**	**2**

Signal definition:

REQ_Height:
Requested level by ECS manual switch
This signal will be set after a manual level request by a driver only for one loop

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H ... 03H

Conversion:

REQ_Height	Function
00H	No Manual Switch input
01H	Normal
02H	High
03H	Low

Receiver of signal and signal features required by the receiver:

CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
REQ_level	**Requested level by ECS switch or automatic**	**ECS1**	**05E0h**	**16**	**4**

Signal definition:

REQ_level:

(1) Without automatic or manual level changes REQ_level=ACT_Height
(2) During level changes new target level = REQ_level. Until the new target level is reached, REQ_level ≠ ACT_Height.
When the new target level has been reached, position (1) is valid.
(3) During manual level changes that are accepted by the ECS system, position (2) is valid. Not permit a specific level, the request is ignored and position (1) is valid.
(4) During automatic level changes position (2) is valid.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H ... 0FH

Conversion:

REQ_level	Function
00H…02H	not used
03H	Low
04H	Highway
05H	Normal
06H	Off-road
07H	High
08H…0FH	not used

Receiver of signal and signal features required by the receiver:

CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
ACT_Height	**Actual level of vehicle**	**ECS1**	**05E0h**	**20**	**4**

Signal definition:

ACT_Height:
The vehicle level of the last finished vehicle level control is indicated. If a new level change is requested and could not be finished it is not shown. Dynamic deviation of actual height is possible

Functional requirements:

Initial value: -

Error identifier: -

Physical range: 00H ... 0FH

Conversion:

ACT_Height	Function
00H…02H	not used
03H	Low
04H	Highway
05H	Normal
06H	Off-road
07H	High
08H…0FH	not used

Receiver of signal and signal features required by the receiver:

CLU

Note:

6.2.37 ECS2 Message

Message: ECS2	Identifier: 03F9h

Signal Label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
Height_FL	Height of front left corner	0	8	-	FFH
Height_FR	Height of front right corner	8	8	-	FFH
Height_RL	Height of rear left corner	16	8	-	FFH
Height_RR	Height of rear right corner	24	8	-	FFH
Free	Free	32	8	00H	-

Memory layout:

Free	32
Height_RR	24
Height_RL	16
Height_FR	8
Height_FL	0

Transmission parameters - Conditions

System	ECS
Output period	20 ms
Output period tolerance	± 6ms
Latency	Max. 5ms
Remote operation	no
Message Time out	500ms
Message Validity	IGN1
Phase relationship to another message	no

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
Height_FL	**Height of front left corner**	**ECS2**	**03F9h**	**0**	**8**
Height_FR	**Height of front right corner**	**ECS2**	**03F9h**	**8**	**8**
Height_RL	**Height of rear left corner**	**ECS2**	**03F9h**	**16**	**8**
Height_RR	**Height of rear right corner**	**ECS2**	**03F9h**	**24**	**8**

Signal definition:

Actual height of each corner of a vehicle.

Functional requirements:

Initial value: -

Error identifier: FFH

Physical range: -128... 125mm= 00H ... FDH

Conversion: (PH) = (HEX) – 128 [mm]

Value	Function
FEH	Not initialized

Receiver of signal and signal features required by the receiver:

CLU, AFLS

Note:

6.2.38 MDPS1 Message

Message: MDPS1	Identifier: 05E4h

Signal Label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
Free	Free	0	1	00H	-
CF_Mdps_WLmp	MDPS Warning Lamp	1	2	00H	-
Free	Free	3	21	00H	-

Memory layout:

Free							16
Free							8
Free	Free	Free	Free	Free	CF_Mdps_WLmp	Free	0

Transmission parameters - Conditions

System	MDPS
Output period	100 ms
Output period tolerance	± 20ms
Latency	Max. 5ms
Remote operation	no
Message Time out	500ms
Message Validity	IGN1
Phase relationship to another message	no

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Mdps_WLmp	**MDPS Warning Lamp**	**MDPS1**	**05E4H**	**1**	**2**

Signal definition:

CF_Mdps_WLmp : The signal indicates the ststus of the “MDPS Warning lamp”

Functional requirement :

Initial value : 00H

Error identifier : -

Physical range: 00..03H

Conversion:

CF_Mdps_WLmp	Function
00H	MDPS Malfunction Warning lamp OFF
01H	Reserved
02H	MDPS Malfunction Warning lamp ON
03H	MDPS Malfunction Warning lamp BLANKING(1Hz) : Diagnostic mode

Receiver of signal and signal features required by the receiver :
%%
CLU, ESC, SPAS

Note:

6.2.39 MDPS2 Message

Message: MDPS2	Identifier: 0392h

$$

Signal Label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
CF_Mdps_Stat	MDPS Status	0	4	01H	-
Free	Free	4	4	0H	-
CR_Mdps_DrvTq	Driver Torque Feedback	8	12	800H	FFFH
Free	Free	20	4	0H	-
CR_Mdps_StrAng	MDPS Steering Angle	24	16	-	7FFFH
CF_Mdps_AliveCnt	Message counter	40	8	00H	-
Free	Free	48	8	-	-
CF_Mdps_Chksum	Signal checksum	56	8	00H	-

Memory layout:

CF_Mdps_Chksum		56
Free		48
CF_Mdps_AliveCnt		40
CR_Mdps_StrAng (MSB)		32
CR_Mdps_StrAng (LSB)		24
Free	CR_Mdps_DrvTq (MSB)	16
CR_Mdps_DrvTq (LSB)		8
Free	CF_Mdps_Stat	0

Transmission parameters - Conditions

System	MDPS
Output period	20 ms
Output period tolerance	± 5ms
Latency	Max. 5ms
Transmit Condition	Power supply via EMS primary relay
Remote operation	no
Message Time out	500ms
Message Validity	IGN1
Phase relationship to another message	no

***NOTE : This message is for the "SPAS(Smart Parking Assist System)" applied vehicles only**

$$

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Mdps_Stat	**MDPS Status**	**MDPS2**	**0392H**	**0**	**4**

Signal definition:

This signal indicates the status of the automatic steering function.

Functional requirement :

Initial value : 01H

Error identifier : -

Physical range: 0 .. 15 = 00 .. 0FH

Conversion:

CF_Mdps_Stat	Function
00H	Reserved
01H	Steering still in initialization phase
02H	Steering ready, waits for SPAS command
03H	Steering set in standby by SPAS
04H	Steering requested to go to first activation step
05H	Steering requested to go to final activation step
06H	Steering went to error internally
07H	Steering aborted the automatic function
08H ~ 0EH	Reserved
0FH	Not Available

Receiver of signal and signal features required by the receiver :

SPAS

Note:

$$

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_Mdps_DrvTq	**Driver Torque Feedback**	**MDPS2**	**0392H**	**8**	**12**

Signal definition:

This value is used to detect a steering intervention of the driver. The SPAS system should then abort immediately. The signal is unsigned 12bits

Functional requirement :

Initial value : 800H

Error identifier : FFFH

Physical range: -20.48 ~ 20.46 Nm = 000H .. FFEH

Conversion: (PH) = (HEX – 2048) × 0.01 [Nm]

Receiver of signal and signal features required by the receiver :

SPAS

Note:

PH > 0: Left Direction (CCW)
PH < 0: Right Direction (CW)

$$

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_Mdps_StrAng	**MDPS Steering Angle**	**MDPS2**	**0392H**	**24**	**16**

Signal definition:

This value is used to inform SPAS of a compensated steering wheel angle by MDPS. The signal is signed 16bits.

Functional requirement :

Initial value : Current angle

Error identifier : 7FFFH

Physical range: 0000H ... FFFFH

Conversion: (PH) = (HEX) × 0.1 (for 0 < HEX ≤ 32767) or
= (HEX - 65536) × 0.1 (for HEX > 32767) [Deg]

Receiver of signal and signal features required by the receiver :

SPAS

Note:

$$

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Mdps_AliveCnt	**Free-running alive counter**	**MDPS2**	**0392H**	**40**	**8**

Signal definition:

This value is used to check the MDPS2 message is transmitted regularly and none have been lost.

Functional requirement :

Initial value : 00H

Error identifier : -

Physical range: 00H ... FFH

Conversion: (PH) = (HEX)

Receiver of signal and signal features required by the receiver :

SPAS

Note:

$$

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Mdps_Chksum	**Signal checksum**	**MDPS2**	**0392H**	**56**	**8**

Signal definition:

This value is used to check the MDPS2 message is transmitted correctly.

Functional requirement :

Initial value : 00H

Error identifier : -

Physical range: 00H ... FFH

Conversion: (PH) = Byte (Byte0+Byte1+Byte2+Byte3+Byte4+Byte5+Byte6)

Receiver of signal and signal features required by the receiver :

SPAS

Note:

6.2.40 YRS1 Message

Message: YRS1	Identifier: 0130h

Signal Label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
CR_Yrs_Yr	Yaw rate	0	16	0000H	FFFFH
CF_Yrs_SnsStat1	Sensor status	16	4	0H	-
CF_Yrs_YrStat	Status information for Yaw rate signal	20	4	0H	-
Free	Free	24	8	00H	-
CR_Yrs_LatAc	Lateral acceleration	32	16	0000H	FFFFH
CR_Yrs_MsgCnt1	Message counter	48	4	0H	-
CF_Yrs_LatAcStat1	Status information for Lateral acceleration signal	52	4	0H	-
CR_Yrs_Crc1	Cyclic redundancy check	56	8	-	-

Memory layout:

CR_Yrs_Crc1		56
CF_Yrs_LatAcStat1	CR_Yrs_MsgCnt1	48
CR_Yrs_LatAc (MSB)		40
CR_Yrs_LatAc (LSB)		32
Free		24
CF_Yrs_YrStat	CF_Yrs_SnsStat1	16
CR_Yrs_Yr (MSB)		8
CR_Yrs_Yr (LSB)		0

Transmission parameters - Conditions

System	YRS
Output period	10 ms
Output period tolerance	± 5ms
Latency	Max. 5ms
Remote operation	no
Message Time out	100ms
Message Validity	IGN1
Phase relationship to another message	no

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_Yrs_Yr	**Yaw rate**	**YRS1**	**0130H**	**0**	**16**

Signal definition:

This signal indicates Information regarding yaw rate.

Functional requirements:

Initial value: 0000H

Error identifier: FFFFH

Physical range: -163.84 .. 163.83 °/s = 0000H .. FFFEH

Conversion: (PH) = ((HEX) – 8000H) * 0.005 [°/s]

Receiver of signal and signal features required by the receiver :

ESC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Yrs_Sns Stat1	**Sensor status**	**YRS1**	**0130H**	**16**	**4**

Signal definition:

This signal indicates sensor failure status.

Functional requirements:

Initial value: 0H

Error identifier: -

Physical range: 0 ... FH

Conversion:

CF_Yrs_SnsStat1	Function
xx00B	No under- / over voltage
xx01B	Under voltage detected
xx10B	Over voltage detected
xx11B	Reserved
x0xxB	No synchronization underflow detected
x100B	Synchronization underflow detected
0xxxB	No synchronization failure detected
1xxxB	Synchronization failure detected

Receiver of signal and signal features required by the receiver :

ESC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Yrs_YrStat	**Status information for Yaw rate signal**	**YRS1**	**0130H**	**20**	**4**

Signal definition:

This signal indicates failure status of yaw rate signal and yaw rate sensing element.

Functional requirements:

Initial value: 0H

Error identifier: -

Physical range: 0 ... FH

Conversion:

CF_Yrs_YrStat	Function
xx00B	Signal in specification
xx01B	Sensor not available
xx10B	Signal failure
xx11B	reserved
x0xxB	Initialization is ready
x1xxB	Initialization is running
0xxxB	Reserved
1xxxB	Reserved

Receiver of signal and signal features required by the receiver :

ESC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_Yrs_Lat Ac	**Lateral acceleration**	**YRS1**	**0130H**	**32**	**16**

Signal definition:

This signal indicates Information regarding lateral acceleration.

Functional requirements:

Initial value: 0000H

Error identifier: FFFFH

Physical range: -4,1768g .. 4.1765g = 0000H .. FFFEH

Conversion: (PH) = ((HEX) – 8000H) * 0,000127465 [g]

Receiver of signal and signal features required by the receiver :

ESC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_Yrs_MsgCnt1	**Message counter**	**YRS1**	**0130H**	**48**	**4**

Signal definition:

Information for the ECU to know if message are lost between the reception of two message.
The sensor repeats the CR_Yrs_MsgCnt1/2 value within the YRS1 and YRS2 messages diagnosis block pointer.

Functional requirements:

Initial value: 0H

Error identifier: -

Physical range: 0 ... FH

Conversion: -

Receiver of signal and signal features required by the receiver :

ESC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Yrs_LatAcStat1	**Status information for Lateral acceleration signal**	**YRS1**	**0130H**	**52**	**4**

Signal definition:

This signal indicates failure status of lateral acceleration signal and sensing element.

Functional requirements:

Initial value: 0H

Error identifier: -

Physical range: 0 ... FH

Conversion:

CF_Yrs_LatAcStat1	Function
xx00B	Signal in specification
xx01B	Sensor not available
xx10B	Signal failure
xx11B	reserved
x0xxB	Initialization is ready
x1xxB	Initialization is running
0xxxB	Reserved
1xxxB	Reserved

Receiver of signal and signal features required by the receiver :

ESC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_Yrs_Crc 1	**Cyclic redundancy check**	**YRS1**	**0130H**	**56**	**8**

Signal definition:

This signal is cyclic redundancy check value.

Functional requirements:

Initial value: Appropriate value

Error identifier: -

Physical range: 00 ... FFH

Conversion: According to SAE J 1850
$[X^8*D(X)+X^n+X^{n+1}+...+X^{n+7}]/P(X) = Q(x) + R(x)/P(X)$
$P(X) = X^8+X^4+X^3+X^2+1$
(PH) = 1's complement of R(X)

Receiver of signal and signal features required by the receiver:

ESC

Note:

6.2.41 YRS2 Message

Message: YRS2	Identifier: 0140h

Signal Label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
CF_Yrs_McuStat	MCU status	0	8	00H	-
CF_Yrs_SnsStat2	Sensor status	8	8	00H	-
Free	Free	16	16	0000H	-
CF_Yrs_ExtSysStat	Extended system status	32	8	-	-
CR_Yrs_Diag	Diagnosis, serial ASCII code	40	8	-	-
CF_Yrs_MsgCnt2	Message counter	48	4	0H	-
CF_Yrs_Type	Supported signal information	52	4	0H	-
CF_Yrs_Crc2	Cyclic redundancy check	56	8	-	-

Memory layout:

CR_Yrs_Crc2		56
CF_Yrs_Type	CR_Yrs_MsgCnt2	48
CR_Yrs_Diag		40
CF_Yrs_ExtSysStat		32
Free		24
Free		16
CF_Yrs_SnsStat2		8
CF_Yrs_McuStat		0

Transmission parameters - Conditions

System	YRS
Output period	10 ms
Output period tolerance	± 5ms
Latency	Max. 5ms
Remote operation	no
Message Time out	100ms
Message Validity	IGN1
Phase relationship to another message	no

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Yrs_McuStat	**MCU status**	**YRS2**	**0140H**	**0**	**8**

Signal definition:

This signal indicates the failure status of MCU.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... FFH

Conversion:

CF_Yrs_McuStat	Function
00000000B	No failure
xxxxxxx1B	Message CF_Yrs_Crc error
xxxxxx1xB	Over voltage detected
xxxxx1xxB	Under voltage detected
xxxx1xxxB	Sensor internal failure (permanent)
xxx1xxxxB	Synchronization failure detected
xx1xxxxxB	Synchronization underflow detected
x1xxxxxxB	Synchronization overflow detected
1xxxxxxxB	Bus off failure

Receiver of signal and signal features required by the receiver :

ESC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Yrs_Sns Stat2	**Sensor status**	**YRS2**	**0140H**	**8**	**8**

Signal definition:

This signal indicates the failure status of sensor.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... FFH

Conversion:

CF_Yrs_SnsStat2	Function
00000000B	No failure
xxxxxxx1B	CR_Yrs_Yr failure (permanent)
xxxxxx1xB	CR_Yrs_LatAc failure (permanent)
xxxxx1xxB	Reserved
xxxx1xxxB	Reserved
xxx1xxxxB	Reserved
xx1xxxxxB	Reserved
x1xxxxxxB	Reserved

Receiver of signal and signal features required by the receiver :

ESC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Yrs_Ext SysStat	**Extended system status**	**YRS2**	**0140H**	**32**	**8**

Signal definition:

This signal indicates the failure status of sensor and sequent order number of CR_Yrs_Diag.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... FFH

Conversion:

CF_Yrs_ExtSysStat	Function
00000000B	No failure
xxxxxxx1B	Reserved
xx00000xB ~xx11111xB	Diagnosis byte sequent number
x1xxxxxxB	Delete error memory status
1xxxxxxxB	Reserved

Receiver of signal and signal features required by the receiver :

ESC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_Yrs_Diag	**Diagnosis, serial ASCII code**	**YRS2**	**0140H**	**40**	**8**

Signal definition:

This signal indicates manufacture information of sensor (only internally used in ESC)

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... FFH

Conversion: -

Receiver of signal and signal features required by the receiver :

ESC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_Yrs_MsgCnt2	**Message counter**	**YRS2**	**0140H**	**48**	**4**

Signal definition:

Information for the ECU to know if message are lost between the reception of two message.
The sensor repeats the CR_Yrs_MsgCnt1/2 value within the YRS1 and YRS2 messages diagnosis block pointer.

Functional requirements:

Initial value: 0H

Error identifier: -

Physical range: 0 ... FH

Conversion: -

Receiver of signal and signal features required by the receiver :

ESC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Yrs_Type	**Supported signal information**	**YRS2**	**0140H**	**52**	**4**

Signal definition:

This signal indicates supported signals that are correspond to sensor type.

Functional requirements:

Initial value: 0H

Error identifier: -

Physical range: 0 ... FH

Conversion:

CF_Yrs_Type	Supported signals		
	Yaw rate	Lateral acceleration	Longitudinal acceleration
0001B	Support	Support	Not support
0010B	Support	Support	Support
Others	Reserved		

Receiver of signal and signal features required by the receiver :

ESC

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_Yrs_Crc2	**Cyclic redundancy check**	**YRS2**	**0140H**	**56**	**8**

Signal definition:

This signal is cyclic redundancy check value.

Functional requirements:

Initial value: Appropriate value

Error identifier: -

Physical range: 00 ... FFH

Conversion: According to SAE J 1850
$[X^8*D(X)+X^n+X^{n+1}+...+X^{n+7}]/P(X) = Q(x) + R(x)/P(X)$
$P(X) = X^8+X^4+X^3+X^2+1$
(PH) = 1's complement of R(X)

Receiver of signal and signal features required by the receiver :

ESC

Note:

6.2.42 YRS3 Message

Message: YRS3	Identifier: 0131h

%%

Signal Label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
CR_Yrs_YawAcc	Yaw rate acceleration	0	16	0000H	FFFFH
Free	Free	16	4	0H	-
CF_Yrs_YawAccStat	Yaw rate acceleration status	20	4	4H	-
Free	Free	24	8	00H	
CR_Yrs_Ax	Longitudinal acceleration	32	16	0000H	FFFFH
CR_Yrs_MsgCnt3	Message counter	48	4	0H	-
CF_Yrs_AxStat	Status information for AX signal	52	4	4H	-
CR_Yrs_Crc3	CRC acc. SAE J1850 standard	56	8	CRC value	-

Memory layout:

CR_Yrs_Crc3		56
CF_Yrs_AxStat	CR_Yrs_MsgCnt3	48
CR_Yrs_Ax(MSB)		40
CR_Yrs_Ax(LSB)		32
Free		24
CF_Yrs_YawAccStat	Free	16
CR_Yrs_YawAcc (MSB)		8
CR_Yrs_YawAcc (LSB)		0

Transmission parameters - Conditions

System	YRS
Output period	20ms, Asynchronous mode 10ms, Synchronous mode
Output period tolerance	± 5ms
Latency	Max. 5ms
Remote operation	no
Message Time out	100ms
Message Validity	IGN1
Phase relationship to another message	no

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_Yrs_Yaw Acc	**Yaw rate acceleration**	**YRS3**	**0131H**	**0**	**16**

Signal definition:

This signal indicates information regarding yaw rate acceleration.

Functional requirements:

Initial value: 0000H

Error identifier: FFFFH

Physical range: -4096 °/s^2 ….. + 4095,75°/s^2 = 0000H….FFFEH
0 °/s^2 = 8000H

Conversion: (PH) = (HEX – 8000H) * 0,125 [°/s^2]

Receiver of signal and signal features required by the receiver:

ESC

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Yrs_Yaw AccStat	**Yaw rate acceleration status**	**YRS3**	**0131H**	**20**	**4**

Signal definition:

This signal indicates “CF_Yrs_YawAcc” signal failure or status of sensor.

Functional requirements:

Initial value: 4H

Error identifier: -

Physical range: 0 ... FH

Conversion:

CF_Yrs_YawAcc Stat	Function
xx00B	Signal in specification
xx01B	Sensor not available
xx10B	Signal failure
xx11B	Reserved
x1xxB	Initialization is running
x0xxB	Initialization is ready
1xxxB	Reserved
0xxxB	Reserved

Receiver of signal and signal features required by the receiver :

ESC

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_Yrs_Ax	**Longitudinal acceleration**	**YRS3**	**0131H**	**32**	**16**

Signal definition:

This signal indicates information regarding longitudinal acceleration.

Functional requirements:

Initial value: 0000H

Error identifier: FFFFH

Physical range: -4.1768g ….. + 4.1765g = 0000H….FFFEH
0 g = 8000H

Conversion: (PH) = (HEX – 8000H) * 0.000127465 [g]

Receiver of signal and signal features required by the receiver:

ESC

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_Yrs_Msg Cnt3	**Message counter**	**YRS3**	**0131H**	**48**	**4**

Signal definition:

Information for the ECU to know if message are lost between the receptions of two messages.
This value repeats CR_Esp_MsgCnt of ESP3 messages during synchronous activity.

Functional requirements:

Initial value: 0H

Error identifier: -

Physical range: 0 … 15 = 0H … FH

Conversion: -

Receiver of signal and signal features required by the receiver:

ESC

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Yrs_AxStat	**Acceleration signal status**	**YRS3**	**0131H**	**52**	**4**

Signal definition:

This signal indicates “CF_Yrs_Ax” signal failure or status of sensor.

Functional requirements:

Initial value: 4H

Error identifier: -

Physical range: 0 ... FH

Conversion:

CF_Yrs_AxStat	Function
xx00B	Signal in specification
xx01B	Sensor not available
xx10B	Signal failure
xx11B	Reserved
x1xxB	Initialization is running
x0xxB	Initialization is ready
1xxxB	Reserved
0xxxB	Reserved

Receiver of signal and signal features required by the receiver :

ESC

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_Yrs_Crc3	**Cyclic redundancy check**	**YRS3**	**0131H**	**56**	**8**

Signal definition:

This signal is cyclic redundancy check value.

Functional requirements:

Initial value: Appropriate value

Error identifier: -

Physical range: 00h….FFH

Conversion: According to SAE J 1850
$[X^8*D(X)+X^n+X^{n+1}+\ldots+X^{n+7}]/P(X)=Q(X)+R(X)/P(X)$
$P(X)=X^8+X^4+X^3+X^2+1$
(PH)=1's complement of R(X)

Receiver of signal and signal features required by the receiver:

ESC

Note:

6.2.43 ESP1 Message

Message: ESP1	Identifier: 047FH

Signal label	Signal designation	Bit add.	Bit ind.	Init value	Error Ident.
AVH_STAT	AVH State (Hydraulic Hold)	0	2	00H	-
AVH_LAMP	Info lamp request to cluster (red/green)	2	4	00H	-
AVH_ALARM	Audio output request	6	2	00H	-
LDM_STAT	Longditudinal dynamic management state (AVH/DBF Readiness)	8	1	00H	-
REQ_EPB_ACT	ESC Requests to EPB	9	2	00H	-
AVH_I_LAMP	AVH active status lamp request to cluster	11	2	00H	-
Reserved	Reserved bits	13	3	00H	-
ROL_CNT_ESP	Message rolling counter for monitoring	16	8	00H	
Reserved	Reserved bits	24	8	00H	
AVH_CLU	Output data for cluster display	32	8	00H	-
Reserved	Reserved bits	40	24	0000H	-

Memory layout:

Reserved				56
Reserved				48
Reserved				40
AVH_CLU				32
Reserved				24
ROL_CNT_ESP				16
Reserved	AVH_I_LAMP	REQ_EPB_ACT	LDM_STAT	8
AVH_ALARM	AVH_LAMP	AVH_STAT		0

Transmission parameters – Conditions

System	ESC
Output period	20ms
Output period tolerance	+- 10ms
Latency	Max. 10ms
Transmit condition	IGN ON
Remote operation	no
Message time out	500ms
Message Validity	IGN1
Phase relationship to another message	no

*NOTE: This message is for “EPB (Electric Parking Brake)” system applied vehicle only.

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
AVH_STAT	**AVH State (Hydraulic Hold)**	**ESP1**	**047FH**	**0**	**2**

Signal definition:

This signal indicates whether the vehicle is held with hydraulic brake (service brake).

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H … 03H

Conversion:

AVH_STAT	State of hydraulic hold	AVH status
00b	No apply	Don't care
01b	Vehicle is held by the service brake	Active
10b	Being released	AVH is being released
11b	Reserved	

Receiver of signal and signal features required by the receiver:

EPB, EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
AVH_LAMP	**Info lamp request for cluster (red/green)**	**ESP1**	**047FH**	**2**	**4**

Signal definition:

Information about the status lamp request from ESC (AVH) to cluster.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H .. 0FH

Conversion:

AVH_LAMP	Red/Green lamp status	Vehicle securing status
0000b	Off	Release State (EPB/ AVH)
xx01b	Red on	
xx10b	Red slow flashing	
xx11b	Red fast flashing	
01xxb	Green on	Hydraulic Hold (AVH)
10xxb	Green slow flashing	Dynamic Braking (AVH)
11xxb	Green fast flashing	Tbd

Receiver of signal and signal features required by the receiver:

CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
AVH_ALARM	**Audio output request**	**ESP1**	**047FH**	**6**	**2**

Signal definition:

This signal indicates that an ESC requests cluster or tone controller to ring the alarm according to the status of an ESC

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H .. 03H

Conversion:

AVH_ALARM	Function
00H	No alarm
01H	Vehicle not secured (AVH_CLU=3) and driver is still inside => comfortable tone
02H	Vehicle not secured (AVH_CLU=3) and driver is not inside => uncomfortable tone

Receiver of signal and signal features required by the receiver:

CLU (Tone control unit)

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
LDM_STAT	**Longditudinal dynamic management state (AVH/DBF Readiness)**	**ESP1**	**047FH**	**8**	**1**

Signal definition:

Information about ESC-Readiness to perform Dynamic Braking Function (DBF) or Automatic Vehicle Hold (AVH) which is requested by AVH switch.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H .. 01H

Conversion:

LDM_STAT	LDM – State	EPB function
00H	ESC ready to DBF/AVH (requested by switch)	EPB is slave
01H	ESC can't perform DBF/AVH (requested by switch)	EPB stand alone

Receiver of signal and signal features required by the receiver:

EPB

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
REQ_EPB_ACT	**ESC Requests to EPB**	**ESP1**	**047FH**	**9**	**2**

Signal definition:

This signal indicates that an ESC requests EPB to activate braking.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H .. 03H

Conversion:

REQ_EPB_ACT	Command set to EPB	AVH status
00H	No request	Don't care
01H	Release request	Active
02H	Close request in comfort mode	Active
03H	Close request in secure mode	Disabled (EPB Stand alone)

Receiver of signal and signal features required by the receiver:

EPB

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
AVH_I_LAMP	**AVH active status lamp request to cluster**	**ESP1**	**047FH**	**11**	**2**

Signal definition:

This signal indicates AVH active status lamp request from ESC to cluster.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H .. 03H

Conversion:

AVH_I_LAMP	Function
00H	Lamp On
01H	Lamp Off
02H	Reserved
03H	Reserved

Receiver of signal and signal features required by the receiver:

CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit lnd.
ROL_CNT_ESP	**Message rolling counter for monitoring**	**ESP1**	**047FH**	**16**	**8**

Signal definition:

This signal is for monitoring the running state of ESC (whether software is running normally or not) and this counter shall be incremented every output period.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H … FFH

Receiver of signal and signal features required by the receiver:

EPB

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
AVH_CLU	**Output data for cluster display**	**ESP1**	**047FH**	**32**	**8**

Signal definition:

An ESC can show its information message to driver on a cluster or a display module with this signal.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: TBD

Conversion:

AVH_CLU	Function
00H	AVH is off
01H	AVH is off – activation failed due to missing operation condition (e.g. driver inside)
02H	AVH is off - activation failed due to missing failsafe condition (e.g. EPB is not available)
03H	AVH is on - vehicle is not secured / system waits for takeover by the driver (e.g. EPB is not available)
04H	AVH is on

Receiver of signal and signal features required by the receiver:

CLU (Display Module)

Note:

6.2.44 ESP2 Message

Message: ESP2	Identifier: 0220H

Signal label	Signal designation	Bit add.	Bit ind.	Init value	Error Ident.
LAT_ACCEL	Lateral acceleration speed	0	11	000H	7FFH
Free	Free	11	3	00H	-
LAT_ACCEL_STAT	Lateral acceleration signal state	14	1	00H	-
LAT_ACCEL_DIAG	Diagnosis mode of lateral acceleration	15	1	00H	-
LONG_ACCEL	Longitudinal acceleration speed	16	11	000H	7FFH
Free	Free	27	3	00H	-
LONG_ACCEL_STAT	Longitudinal acceleration signal state	30	1	00H	-
LONG_ACCEL_DIAG	Diagnosis mode of longitudinal acceleration	31	1	00H	-
CYL_PRES	Master cylinder pressure	32	12	000H	FFFH
Free	Free	44	2	00H	-
CYL_PRES_STAT	Master cylinder pressure state	46	1	00H	-
CYL_PRES_DIAG	Diagnosis mode of master cylinder pressure	47	1	00H	-
YAW_RATE	Yaw rate	48	13	0000H	1FFFH
Free	Free	61	1	00H	-
YAW_RATE_STAT	Yaw rate signal state	62	1	00H	-
YAW_RATE_DIAG	Diagnosis mode of yaw rate	63	1	00H	-

Memory layout:

YAW_RATE_DIAG	YAW_RATE_STAT	Free	YAW_RATE (high)	56
YAW_RATE (low)				48
CYL_PRES_DIAG	CYL_PRES_STAT	Free	CYL_PRES (high)	40
CYL_PRES (low)				32
LONG_ACCEL_DIAG	LONG_ACCEL_STAT	Free	LONG_ACCEL (high)	24
LONG_ACCEL (low)				16
LAT_ACCEL_DIAG	LAT_ACCEL_STAT	Free	LAT_ACCEL (high)	8
LAT_ACCEL (low)				0

Transmission parameters – Conditions

System	ESC
Output period	10ms
Output period tolerance	+- 2ms
Latency	Max. 6ms
Transmit condition	IGN ON
Remote operation	no
Message time out	500ms
Message Validity	IGN1
Phase relationship to another message	no

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
LAT_ACCEL	**Lateral acceleration speed**	**ESP2**	**0220H**	**0**	**11**

Signal definition:

This signal indicates lateral acceleration speed information.

Functional requirements:

Initial value: 000H

Error identifier: 7FFH

Physical range: -10.23 … 10.23 m/s^2 = 000H … 7FEH

Conversion: (PH) = 0.01* (HEX) – 10.23 [m/s^2]

Receiver of signal and signal features required by the receiver:
%%
SCC, PSB, 4WD

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
LAT_ACCEL_STAT	**Lateral acceleration signal state**	**ESP2**	**0220H**	**14**	**1**

Signal definition:

This signal indicates validity of LAT_ACCEL signal. If acceleration signal is invalid, this signal shall be set to 1.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0..1 = 00H .. 01H

Conversion:

LAT_ACCEL_STAT	Function
0	Lateral acceleration signal is valid
1	Lateral acceleration signal is invalid

Receiver of signal and signal features required by the receiver:
%%
SCC, PSB, 4WD

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
LAT_ACCEL_DIAG	**Diagnosis mode of lateral acceleration**	**ESP2**	**0220H**	**15**	**1**

Signal definition:

This signal indicates self-diagnosis mode of lateral acceleration signal. During system check, lateral acceleration speed information cannot be sent(not available) and this bit should be set to 1.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0..1 = 00H .. 01H

Conversion:

LAT_ACCEL_DIAG	Function
0	Lateral acceleration signal is available
1	Lateral acceleration signal is not available temporarily.

Receiver of signal and signal features required by the receiver:
%%
SCC, PSB, 4WD

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
LONG_ACCEL	**Longitudinal acceleration speed**	**ESP2**	**0220H**	**16**	**11**

Signal definition:

This signal indicates longitudinal acceleration speed information.

Functional requirements:

Initial value: 000H

Error identifier: 7FFH

Physical range: -10.23 … 10.23 m/s^2 = 000H … 7FEH

Conversion: (PH) = 0.01* (HEX) – 10.23 [m/s^2]

Receiver of signal and signal features required by the receiver:
%%
EPB, PSB, TCU, SPAS, 4WD

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
LONG_ACCEL_STAT	**Longitudinal acceleration signal state**	**ESP2**	**0220H**	**30**	**1**

Signal definition:

This signal indicates validity of LONG_ACCEL signal. If acceleration signal is invalid, this signal shall be set to 1.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0..1 = 00H .. 01H

Conversion:

LONG_ACCEL_STAT	Function
0	Longitudinal acceleration signal is valid
1	Longitudinal acceleration signal is invalid

Receiver of signal and signal features required by the receiver:
%%
PSB, SPAS, 4WD

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
LONG_ACCEL_DIAG	**Diagnosis mode of longitudinal acceleration**	**ESP2**	**0220H**	**31**	**1**

Signal definition:

This signal indicates self-diagnosis mode of longitudinal acceleration signal. During system check, longitudinal acceleration speed information cannot be sent(not available) and this bit should be set to 1.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0..1 = 00H .. 01H

Conversion:

LONG_ACCEL_DIAG	Function
0	Longitudinal acceleration signal is available
1	Longitudinal acceleration signal is not available temporarily.

Receiver of signal and signal features required by the receiver:
%%
PSB, SPAS, 4WD

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CYL_PRES	**Master cylinder pressure**	**ESP2**	**0220H**	**32**	**12**

Signal definition:

This signal indicates pressure of brake master cylinder and provides information how deeply a driver is pressing brake pedal.

Functional requirements:

Initial value: 000H

Error identifier: FFFH

Physical range: 0 … 409.4 bar = 000H … FFEH

Conversion: (PH) = 0.1* (HEX) [bar]

Receiver of signal and signal features required by the receiver:
%%
ECS, PSB, TCU, EPB

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CYL_PRES_STAT	**Master cylinder pressure state**	**ESP2**	**0220H**	**46**	**1**

Signal definition:

This signal indicates validity of CYL_PRES signal. If pressure signal is invalid, this signal shall be set to 1.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0..1 = 00H .. 01H

Conversion:

CYL_PRES_STAT	Function
0	Master cylinder pressure signal is valid
1	Master cylinder pressure signal is invalid

Receiver of signal and signal features required by the receiver:
%%
ECS, PSB, EPB

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CYL_PRES_DIAG	**Diagnosis mode of master cylinder pressure**	**ESP2**	**0220H**	**47**	**1**

Signal definition:

This signal indicates self-diagnosis mode of master cylinder pressure signal. During system check, master cylinder pressure information cannot be sent(not available) and this bit should be set to 1.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0..1 = 00H .. 01H

Conversion:

CYL_PRES_DIAG	Function
0	Master cylinder pressure signal is available
1	Master cylinder pressure is not available temporarily.

Receiver of signal and signal features required by the receiver:
%%
ECS, PSB, EPB

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
YAW_RATE	**Yaw rate**	**ESP2**	**0220H**	**48**	**13**

Signal definition:

The yaw rate signal provides information about the lateral motion of a vehicle and is used to calculate the curvature of the current vehicle trajectory. This signal is essential to SCC control in curves or during lane changes. If the demanded requirements can't be guaranteed due to sensor malfunction, SCC has to be informed and SCC has to switch off. In case of reduced accuracy, e.g. if tire adjustment is not finished, the current available accuracy has to be sent to SCC.

Functional requirements:

Initial value: 0000H

Error identifier: 1FFFH

Physical range: -40.95 ... +40.95 °/s = 00H ... 1FFEH

Conversion : (PH) = (0.01 * (HEX)) – 40.95 [°/s]

Receiver of signal and signal features required by the receiver:
%%
SCC, PSB, AFLS, SPAS, LDWS, 4WD

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
YAW_RATE_STAT	**Yaw rate signal state**	**ESP2**	**0220H**	**62**	**1**

Signal definition:

This signal indicates validity of YAW_RATE signal. If yaw rate sensor signal is invalid, this signal shall be set to 1.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0..1 = 00H .. 01H

Conversion:

YAW_RATE_STAT	Function
0	Yaw rate sensor signal is valid
1	Yaw rate sensor signal is invalid

Receiver of signal and signal features required by the receiver:
%%
SCC, PSB, AFLS, SPAS, LDWS, 4WD

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
YAW_RATE_DIAG	**Diagnosis mode of yaw rate sensor**	**ESP2**	**0220H**	**63**	**1**

Signal definition:

This signal indicates self-diagnosis mode of yaw rate sensor. During system check, yaw rate information cannot be sent(not available) and this bit should be set to 1.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0..1 = 00H .. 01H

Conversion:

YAW_RATE_DIAG	Function
0	Yaw rate signal is available
1	Yaw rate signal is not available temporarily.

Receiver of signal and signal features required by the receiver:
%%
SCC, PSB, AFLS, SPAS, LDWS, 4WD

Note:

6.2.45 ESP3 Message

Message: ESP3	Identifier: 0002h

Signal Label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
Free	Free	0	16	0000H	-
CF_Esp_FuncDem	System function demands	16	8	00H	-
Free	Free	24	16	0000H	-
CF_Esp_DiagPtr	Diagnosis block pointer	40	8	00H	-
CR_Esp_MsgCnt	Message counter	48	4	0H	-
Free	Free	52	4	0H	-
CR_Esp_Crc	Cyclic redundancy check	56	8	-	-

Memory layout:

CR_Esp_Crc		56
Free	CR_Esp_MsgCnt	48
CF_Esp_DiagPtr		40
Free		32
Free		24
CF_Esp_FuncDem		16
Free		8
Free		0

Transmission parameters - Conditions

System	ESC
Output period	10 ms
Output period tolerance	± 5ms
Latency	Max. 5ms
Remote operation	no
Message Time out	100ms
Message Validity	IGN1
Phase relationship to another message	no

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Esp_FuncDem	**System function demands**	**ESP3**	**0002H**	**16**	**8**

Signal definition:

This signal indicates Interface signal between ESC and YRS, demands a specific function of YRS.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... FFH

Conversion:

CF_Esp_FuncDem	Function
00000000B	No request of specific function
00000001B	Ignition Counter
00000010B	Delete Error Memory (Attention : after an EEPROM write cycle a minimum pause of 2s for next read cycle is mandatory)
00100000B	Keep quiet
01000000B	Reset
Others	Reserved

Receiver of signal and signal features required by the receiver :

YRS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Esp_DiagPtr	**Diagnosis block pointer**	**ESP3**	**0002H**	**40**	**8**

Signal definition:

This signal indicates that ESC request manufacturing information of YRS

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... FFH

Conversion:

CF_Esp_DiagPtr	Function
00H	Request customer part number
01H	Request supplier part number
02H	Request vehicle modification index
03H	Request sensor software version
04H	Request sensor software identifier
05H	Request sensor hardware version
06H	Request manufacturing date
07H	Request supplier modification index
08H	Request supplier name
09H	Request part number
0AH	Request manufacturer process Index
0B-0EH	Reserved
0FH	Request cyclic pass through of text blocks
10H-FFH	Reserved

Receiver of signal and signal features required by the receiver :

YRS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_Esp_MsgCnt	**Message counter**	**ESP3**	**0002H**	**48**	**4**

Signal definition:

Information for the ECU to know if message are lost between the reception of two message.
The sensor repeats the CR_Yrs_MsgCnt1/2 value within the YRS1 and YRS2 messages diagnosis block pointer.

Functional requirements:

Initial value: 0H

Error identifier: -

Physical range: 0 ... FH

Conversion: -

Receiver of signal and signal features required by the receiver :

YRS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_Esp_Crc	**Cyclic redundancy check**	**ESP3**	**0002H**	**56**	**8**

Signal definition:

This signal is cyclic redundancy check value.

Functional requirements:

Initial value: Appropriate value

Error identifier: -

Physical range: 00 ... FFH

Conversion: According to SAE J 1850
$[X^8*D(X)+X^n+X^{n+1}+...+X^{n+7}]/P(X) = Q(x) + R(x)/P(X)$
$P(X) = X^8+X^4+X^3+X^2+1$
(PH) = 1's complement of R(X)

Receiver of signal and signal features required by the receiver :

YRS

Note:

6.2.46 ESP4 Message

Message: ESP4	Identifier: 0385H

%%

Signal label	Signal designation	Bit add.	Bit ind.	Init value	Error Ident.
CF_VSM_Coded	Flag which tells if ESC is coded for VSM or not	0	1	00H	-
CF_VSM_Avail	Flag which tells if ESC is available for VSM or not	1	2	00H	-
CF_VSM_Handshake	Flag which tells if ESC is ok or not	3	1	00H	-
CF_DriBkeStat	Flag which indicate the driver braking state	4	1	00H	-
CF_VSM_ConfSwi	Switch state which is to change VSM2 configuration	5	2	00H	03H
Free	Free	7	49	00H	-
CR_ESP_Alive	ESP4 Message Alive-counter	56	4	00H	-
CR_ESP_ChkSum	ESP4 Message Checksum	60	4	00H	-

Memory layout:

CR_ESP_ChkSum				CR_ESP_Alive		56
Free						48
Free						40
Free						32
Free						24
Free						16
Free						8
Free	CF_VSM_ConfSwi	CF_DriBkeStat	CF_VSM_Handshake	CF_VSM_Avail	CF_VSM_Coded	0

Transmission parameters – Conditions

System	ESC
Output period	20ms
Output period tolerance	+- 5ms
Latency	Max. 5ms
Transmit condition	IGN ON
Remote operation	no
Message time out	500ms
Message Validity	IGN1
Phase relationship to another message	no

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_VSM_Coded	**Flag which tells if ESC is coded for VSM or not**	**ESP4**	**0385H**	**0**	**1**

Signal definition:

This signal indicates flag which tells if ESC is coded for VSM or not.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0..1 = 00H .. 01H

Conversion:

CF_VSM_Coded	Function
0	Not coded
1	Coded

Receiver of signal and signal features required by the receiver:

SCC

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_VSM_Avail	**Flag which tells if ESC is available for VSM or not**	**ESP4**	**0385H**	**1**	**2**

Signal definition:

This signal indicates state signal from ESC to SCC which tells if ESC is “not available”, “available”, “Temporarily not available” or “permanently not available”.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0..3 = 00H .. 03H

Conversion:

CF_VSM_Avail	Function
0	Not available
1	Available
2	Temporarily not available
3	Permanently not available

Receiver of signal and signal features required by the receiver:

SCC

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_VSM_Handshake	**Flag which tells if ESC is ok or not**	**ESP4**	**0385H**	**3**	**1**

Signal definition:

This signal indicates flag from ESC to SCC which tells if ESC is ok or not.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0..1 = 00H .. 01H

Conversion:

CF_VSM_Handshake	Function
0	Not okay
1	Okay

Receiver of signal and signal features required by the receiver:

SCC

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_DriBkeStat	**Flag which indicate the driver braking state**	**ESP4**	**0385H**	**4**	**1**

Signal definition:

This signal indicates flag from ESC to SCC to indicate the driver braking state

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0..1 = 00H .. 01H

Conversion:

CF_DriBkeStat	Function
0	Driver is not braking / failure
1	Driver is braking

Receiver of signal and signal features required by the receiver:

SCC

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_VSM_ConfSwi	**Switch state which is to change VSM2 configuration**	**ESP4**	**0385H**	**5**	**2**

Signal definition:

Switch state which is to configure change VSM2 configuration.

Functional requirements:

Initial value: 00H

Error identifier: 03H

Physical range: 0..3 = 00H .. 03H

Conversion:

CF_VSM_ConfSwi	Function
0	Switch Not Pressed
1	Switch Pressed
2	Reserved
3	Error Identifier (switch failure detected by ESC or CAN communication failure)

Receiver of signal and signal features required by the receiver:

SCC

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit lnd.
CR_ESP_Alive	**ESP4 Message Alive-counter**	**ESP4**	**0385H**	**56**	**4**

Signal definition:

This signal indicates Alive-counter of ESP4 Message

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 0FH

Conversion: (PH) = 1 * (HEX)
0 … 14 : counter, cyclic
15 : signal invalid

Receiver of signal and signal features required by the receiver:

SCC

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_ESP_ChkSum	**ESP4 Message Checksum**	**ESP4**	**0385H**	**60**	**4**

Signal definition:

This signal indicates Checksum of ESP4 Message

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: -

Conversion: (PH) = 10h - (least significant nibbles of (Byte0 + Byte1 + Byte2 + Byte3 + Byte4 + Byte5 + Byte6 + Byet7) + most significant nibbles of (Byte0 + Byte1 + Byte2 + Byte3 + Byte4 + Byte5 + Byte6))

Receiver of signal and signal features required by the receiver:

SCC

Note:

6.2.47 FATC Message

Message: FATC	Identifier: 0350h

##

Signal Label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
CR_Fatc_TqAcnOut	Calculated A/C COMP torque	0	8	00H	FFH
CF_Fatc_AcnRqSwi	A/C request switch	8	1	00H	-
CF_Fatc_AcnCltEnRq	A/C(COMP) Clutch enable request	9	1	00H	-
CF_Fatc_EcvFlt	ECV Control Fault	10	1	00H	-
CF_Fatc_BlwrOn	Blower On Flag	11	1	00H	-
CF_FATC_Iden	FATC ID	12	2	00H	-
CF_Fatc_BlwrMax	FATC Max Blower State	14	1	00H	-
CF_Fatc_EngStartReq	Engine Auto Start request	15	1	00H	-
CF_Fatc_IsgStopReq	ISG Stop enable/disable request	16	1	00H	-
CF_Fatc_CtrInf	Heater Control information	17	3	00H	-
CF_Fatc_MsgCnt	Alive Count	20	4	00H	-
CR_Fatc_OutTemp	Outside Temperature(FATC)	24	8	00H	FFH
CR_Fatc_OutTempSns	Temperature of Ambient Sensor	32	8	00H	FFH
Free	Free	40	16	00H	-
CF_Fatc_ChkSum	Check Sum	56	8	00H	-

Memory layout:

CF_Fatc_ChkSum							56
Free							48
Free							40
CR_Fatc_OutTempSns							32
CR_Fatc_OutTemp							24
CF_Fatc_MsgCnt			CF_Fatc_CtrInf			CF_Fatc_IsgStopReq	16
CF_Fatc_EngStartReq	CF_Fatc_BlwrMax	CF_FATC_Iden	CF_Fatc_BlwrOn	CF_Fatc_EcvFlt	CF_Fatc_AcnCltEnRq	CF_Fatc_AcnRqSwi	8
CR_Fatc_TqAcnOut							0

%%

Transmission parameters - Conditions

System	FATC
Output period	10 ms
Output period tolerance	± 5ms
Latency	Max. 5ms
Remote operation	no
Message Time out	500ms
Message Validity	IGN2
Phase relationship to another message	no

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_Fatc_TqAcn Out	**Calculated A/C COMP Torque**	**FATC**	**0350H**	**0**	**8**

Signal definition:

This signal indicates the torque output of A/C compressor calculated by FATC.
EMS decides the torque compensation value or A/C compressor clutch disengagement (off) by receiving of this signal.

Functional requirements:

Initial value: 00H

Error identifier: FFH

Physical range: 0 ~ 50.8 Nm = 00H ... FEH

Conversion: (PH) = 0.2 * (HEX) [Nm]

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Fatc_AcnRqSwiC	**A/C requset switch**	**FATC**	**0350H**	**8**	**1**

Signal definition:

This signal indicates A/C request switch by FATC
This signal occurs when A/C switch(button) is selected either manually or automatically.
EMS decides the torque compensation value to avoid torque shortage while A/C on

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H … 01H

Conversion:

Value	Function
00H	A/C off request
01H	A/C on request

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Fatc_AcnCltEnRq	**A/C(COMP) Clutch enable request**	**FATC**	**0350H**	**9**	**1**

Signal definition:

FATC requests A/C compressor clutch on or off to EMS by this signal
This signal is off to maintain a/c refrigerant flow and air flow smoothly and avoid abnormal a/c compressor torque rising even though A/C request switch on, if the surface temperature of evaporator is below the certain icing temperature.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H … 01H

Conversion:

Value	Function
00H	A/C clutch disable request
01H	A/C clutch enable request

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Fatc_EcvFlt	**ECV Control Fault**	**FATC**	**0350H**	**10**	**1**

Signal definition:

This signal indicates ECV control fault.
The detailed fault state is in the error identifiers of CR_Fatc_TqAcnOut signal

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H … 01H

Conversion:

Value	Function
00H	Normal (No fault)
01H	ECV Control Fault

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Fatc_BlwrOn	**Blower On Flag**	**FATC**	**0350H**	**11**	**1**

Signal definition:

This signal indicates HVAC blower motor operation condition.
The signal is used for EMS to decide PTC on or manage battery level.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H … 01H

Conversion:

Value	Function
00H	HVAC Blower off
01H	HVAC Blower on

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_FATC_Iden	**FATC ID**	**FATC**	**0350H**	**12**	**2**

Signal definition:

This signal FATC_ID identifies FATC Maker.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H … 03H

Conversion:

Value	Function
00H	FATC Type 0 (reserved)
01H	FATC Type 1 (Doowon)
02H	FATC Type 2 (Halla)
03H	FATC Type 3 (reserved)

Receiver of signal and signal features required by the receiver:

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Fatc_BlwrMax	**FATC Max Blower State**	**FATC**	**0350H**	**14**	**1**

Signal definition:

This signal indicates that FATC operates HVAC blower by maximum speed

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H … 01H

Conversion:

CF_Fatc_BlwrMax	Function
00H	Max blower speed is not selected
01H	Max blower speed is selected

Receiver of signal and signal features required by the receiver:

EMS

Note:

##

LABEL	Designation	Message	Identifier	Bit add.	Bit lnd.
CF_Fatc_EngStartReq	**Engine Auto Start request**	**FATC**	**0350H**	**15**	**1**

Signal definition:

FATC requests Engine Auto Start to EMS by this signal during idle stop.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H … 01H

Conversion:

CF_Fatc_EngStart Req	Function
00H	Normal
01H	Engine Auto Start Request

Receiver of signal and signal features required by the receiver:

EMS

Note:

##

LABEL	Designation	Message	Identifier	Bit add.	Bit lnd.
CF_Fatc_IsgStopReq	**ISG Stop enable/disable request**	**FATC**	**0350H**	**16**	**1**

Signal definition:

FATC requests EMS that ISG is prohibited (ISG function is not operating) by this signal.
FATC send the disable signal in the condition, for example HVAC Blower is Max.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H … 01H

Conversion:

CF_Fatc_IsgStopReq	Function
00H	Enable
01H	Disable (Engine Stop is prohibited)

Receiver of signal and signal features required by the receiver:

EMS

Note:

##

LABEL	Designation	Message	Identifier	Bit add.	Bit lnd.
CF_Fatc_CtrInf	**Heater Control information**	**FATC**	**0350H**	**17**	**3**

Signal definition:

Heater Control(FATC/MTC) information generated by HVAC Compressor type.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H … 07H

Conversion:

CF_Fatc_CtrInf	Function
00H	Internal Compressor (for example)
01H	External Compressor with Comp clutch (for example)
02H	External Compressor without Comp clutch (for example)
03H	Reserved
04H	Reserved
05H	Reserved
06H	Reserved
07H	Reserved

Receiver of signal and signal features required by the receiver:

EMS

Note:

Conversion is not fixed.

##

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Fatc_MsgCnt	**Alive Count**	**FATC**	**0350H**	**20**	**4**

Signal definition:

Information for the EMS to know if message are lost between the reception of two message.
This signal enables the systems which are using signals from FATC to check whether the FATC message is updated or not.
The counter has to be increased by 1 after sending of a frame. Start with0. If the counter reaches 15, it will restart with 0 at the next frame.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0 ~ 15 = 00H ... 0FH

Conversion: (PH) = 1 * (HEX) [Nm]

Receiver of signal and signal features required by the receiver:

EMS

Note:

##

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_Fatc_OutTemp	**Outside Temperature(FATC)**	**FATC**	**0350H**	**24**	**8**

Signal definition:

Outside temperature in FATC sensed via an A/D converter; converted into degrees centigrade (℃)
This information is only used for climate control operation.

Functional requirements:

Initial value: 00H

Error identifier: FFH

Physical range: -40 .. 60 ℃ = 00H .. C8H

Conversion: (PH) = 0.5*(HEX) - 40 [℃]

Receiver of signal and signal features required by the receiver:

EMS

Note:

##

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_Fatc_OutTempSns	**Temperature of Ambient Sensor**	**FATC**	**0350H**	**32**	**8**

Signal definition:

Actual temperature of Ambient Sensor via an A/D converter; converted into degrees centigrade (℃).
This is raw data of ambient sensor; just transferred from Ambient Sensor Voltage.

Functional requirements:

Initial value: 00H

Error identifier: FFH

Physical range: -40 .. 60 ℃ = 00H .. C8H

Conversion: (PH) = 0.5*(HEX) - 40 [℃]

Receiver of signal and signal features required by the receiver:

CLU, SPAS

Note:

##

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Fatc_ChkSum	**Check Sum**	**FATC**	**0350H**	**56**	**8**

Signal definition:

This value is used to check the FATC message is correctly transmitted.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H .. FFH

Conversion: (PH) = Byte0 XOR Byte1 XOR Byte2 XOR Byte3 XOR Byte 4 XOR Byte5 XOR Byte6
All unused bytes(Free) in the frame will be set to 00.

Receiver of signal and signal features required by the receiver:
%%
EMS, SPAS

Note:

6.2.48 ACU1 Message

Message: ACU1	Identifier: 05A0h

Signal Label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
Free	Free	0	1	0H	-
CF_Ods_SNRcv	ODS SN Received	1	1	0H	-
CF_Ods_IDRcv	ODS ID Received	2	1	0H	-
CF_Ods_FltClrReq	ODS Fault Clear Request	3	1	0H	-
CF_Ods_RZReq	ODS Empty Seat Rezero Request	4	1	0H	-
Free	Free	5	1	0H	-
CF_Abg_DepInhEnt	Airbag Deploy Inhibited Event	6	1	0H	-
CF_Abg_DepEnt	Airbag Deploy Event	7	1	0H	-
CR_Acu_DepMsgCnt	ACU Deploy Message Counter	8	8	00H	-
CR_Acu_DepEntCnt	ACU Deploy Event Counter	16	8	00H	-
Free	Free	24	4	0H	-
CF_PasBkl_FltStat	Passenger Buckle Fault Status	28	1	0H	-
CF_DriBkl_FltStat	Driver Buckle Fault Status	29	1	0H	-
CF_PasBkl_Stat	Passenger Buckle Status	30	1	0H	-
CF_DriBkl_Stat	Driver Buckle Status	31	1	0H	-
Free	Free	32	32	00H	-

Memory layout:

Free								56
Free								48
Free								40
Free								32
CF_DriBkl_Stat	CF_PasBkl_Stat	CF_DriBkl_FltStat	CF_PasBkl_FltStat	Free	Free	Free	Free	24
CR_Acu_DepEntCnt								16
CR_Acu_DepMsgCnt								8
CF_Abg_DepEnt	CF_Abg_DepInhEnt	Free	CF_Ods_RZReq	CF_Ods_FltClrReq	CF_Ods_IDRcv	CF_Ods_SNRcv	Free	0

Transmission parameters - Conditions

System	ACU
Output period	1000 ms
Output period tolerance	100 ms
Latency	Max. 5ms
Transmit condition	Ignition Power ON
Remote operation	no
Message Time out	no
Message Validity	IGN1
Phase relationship to another message	no

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Ods_SNRcv	**ODS SN Received**	**ACU1**	**05A0H**	**1**	**1**

Signal definition:

It is a Request to send ODS Serial Number. If the Bit is equal to `0` the ODS-B module will transmit the SWS Serial Number message. ACU sets “ODS S/N Received” to ‘1’ after getting 8-byte ODS Serial number two times.

Functional requirements:

Initial value: 0H

Error identifier: -

Physical range: 0H … 1H

Conversion:

Value	Function
0	Request to send ODS Serial Number
1	Acknowledgement for the Correct S/N Received.

Receiver of signal and signal features required by the receiver:

ODS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Ods_IDRcv	**ODS ID Received**	**ACU1**	**05A0H**	**2**	**1**

Signal definition:

It s a Request to send ODS Identifier. If the Bit is equal to `0` the ODS-B module will transmit the ODS identifier message. ACU sets “ODS ID Received” to ‘1’ after getting the valid ODS ID two times.

Functional requirements:

Initial value: 0H

Error identifier: -

Physical range: 0H … 1H

Conversion:

Value	Function
0	Request to send ODS Identifier
1	Acknowledgement for the Correct ODS Identifier Received.

Receiver of signal and signal features required by the receiver:

ODS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Ods_FltClrReq	**ODS Fault Clear Request**	**ACU1**	**05A0H**	**3**	**1**

Signal definition:

It is a request to clear ODS Fault codes. When this bit 3 is set to ‘1’, the ODS-B module will clear all existing ODS faults.

Functional requirements:

Initial value: 0H

Error identifier: -

Physical range: 0H … 1H

Conversion:

Value	Function
0	No Fault Clear Requested
1	Request to clear ODS Fault codes

Receiver of signal and signal features required by the receiver:

ODS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Ods_RZReq	**ODS Empty Seat Rezero Request**	**ACU1**	**05A0H**	**4**	**1**

Signal definition:

It is a request to ODS–B to re-zero the empty seat offset. When this bit 4 is set to ‘1’, the ODS-B module will re-zero the empty seat offset.

Functional requirements:

Initial value: 0H

Error identifier: -

Physical range: 0H … 1H

Conversion:

Value	Function
0	No re-zero request
1	Request to re-zero the empty seat offset

Receiver of signal and signal features required by the receiver:

ODS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Abg_DepInhEnt	**Airbag Deploy Inhibited Event**	**ACU1**	**05A0H**	**6**	**1**

Signal definition:

Information of Crash event with Passenger Front 1st stage /Side Airbag Inhibition.

Functional requirements:

Initial value: 0H

Error identifier: -

Physical range: 0H … 1H

Conversion:

Value	Function
0	Default Value
1	Crash event with Passenger Front/Side Airbag Inhibited.

Receiver of signal and signal features required by the receiver:

ODS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Abg_DepEnt	**Airbag Deploy Event**	**ACU1**	**05A0H**	**7**	**1**

Signal definition:

Information of Crash event with Passenger Front 1st stage /Side Airbag No-Inhibition.

Functional requirements:

Initial value: 0H

Error identifier: -

Physical range: 0H … 1H

Conversion:

Value	Function
0	Default Value
1	Crash event with Passenger Front/Side Airbag not Inhibited.

Receiver of signal and signal features required by the receiver:

ODS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_Acu_DepMsgCnt	**ACU Deploy Message Counter**	**ACU1**	**05A0H**	**8**	**8**

Signal definition:

Information of ACU_Deploy_Message_Counter increment following a collision event.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0 ... 50 = 00H … 32H

Conversion: (PH) = (HEX)

Receiver of signal and signal features required by the receiver :

ODS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_Acu_DepEntCnt	**ACU Deploy Event Counter**	**ACU1**	**05A0H**	**16**	**8**

Signal definition:

Information of ACU_Deploy_Event_Counter increment following a collision event. The ACU Deploy Event Counter will be incremented once per collision event & sent to ODS.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 0 ... 14 = 00H … 0EH

Conversion: (PH) = (HEX)

Receiver of signal and signal features required by the receiver :

ODS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_PasBkl_FltStat	**Passenger Buckle Fault Status**	**ACU1**	**05A0H**	**28**	**1**

Signal definition:

Information of Passenger Seat Belt Buckle switch Fault condition.

Functional requirements:

Initial value: 0H

Error identifier: -

Physical range: 0H … 1H

Conversion:

Value	Function
0	No Fault
1	Fault condition exists

Receiver of signal and signal features required by the receiver:

ODS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_DriBkl_FltStat	**Driver Buckle Fault Status**	**ACU1**	**05A0H**	**29**	**1**

Signal definition:

Information of Driver Seat Belt Buckle switch Fault condition.

Functional requirements:

Initial value: 0H

Error identifier: -

Physical range: 0H … 1H

Conversion:

Value	Function
0	No Fault
1	Fault condition exists

Receiver of signal and signal features required by the receiver:

ODS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_PasBkl_Stat	**Passenger Buckle Status**	**ACU1**	**05A0H**	**30**	**1**

Signal definition:

Information of Passenger Seat Belt Buckle switch Status, whether its Latched or Not .

Functional requirements:

Initial value: 0H

Error identifier: -

Physical range: 0H … 1H

Conversion:

Value	Function
0	Passenger Seat Belt Not Latched
1	Passenger Seat Belt Latched

Receiver of signal and signal features required by the receiver:

ODS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_DriBkl_Stat	**Driver Buckle Status**	**ACU1**	**05A0H**	**31**	**1**

Signal definition:

Information of Driver Seat Belt Buckle switch Status, whether its Latched or Not .

Functional requirements:

Initial value: 0H

Error identifier: -

Physical range: 0H … 1H

Conversion:

Value	Function
0	Driver Seat Belt Not Latched
1	Driver Seat Belt Latched

Receiver of signal and signal features required by the receiver:

ODS

Note:

6.2.49 ACU2 Message

Message: ACU2	Identifier: 05A1h

Signal Label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
CR_Acu_SN	ACU Serial Number	0	64	-	-

Memory layout:

CR_Acu_SN (8th byte)	56
CR_Acu_SN (7th byte)	48
CR_Acu_SN (6th byte)	40
CR_Acu_SN (5th byte)	32
CR_Acu_SN (4th byte)	24
CR_Acu_SN (3rd byte)	16
CR_Acu_SN (2nd byte)	8
CR_Acu_SN (1st byte)	0

Transmission parameters - Conditions

System	ACU
Output period	1 second until CF_Ods_AcuRcvSN is set to 1 in ODS1 message
Output period tolerance	100 ms
Latency	Max. 5ms
Transmit condition	Ignition Power ON
Remote operation	no
Message Time out	no
Message Validity	IGN1
Phase relationship to another message	no

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_Acu_SN	**ACU Serial Number**	**ACU2**	**05A1H**	**0**	**64**

Signal definition:

This message will contain the ACU Serial Number, which will not exceed 8 bytes.
The ACU will continue to transmit the ACU Serial Number message whenever the “ACU S/N Received” bit is equal to a ‘0’ in the ODS Status message.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: -

Conversion: (PH) = (HEX)

Receiver of signal and signal features required by the receiver :

ODS

Note:

6.2.50 ACU3 Message

Message: ACU3	Identifier: 0010h

Signal Label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
CF_Acu_CshAct	Crash Active	0	1	0H	-
Free	Free	1	63	0H	-

Memory layout:

Free								56
Free								48
Free								40
Free								32
Free								24
Free								16
Free								8
Free	Free	Free	Free	Free	Free	Free	CF_Acu_CshAct	0

Transmission parameters - Conditions

System	ACU
Output period	Shown in the diagram in next page
Output period tolerance	+ 2 ms
Latency	max.2 ms
Transmit condition	Crash Detected and Crash Output message started
Remote operation	no
Message Time out	no
Message Validity	IGN1
Phase relationship to another message	no

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Acu_CshAct	**Crash Active**	**ACU3**	**0010H**	**0**	**1**

Signal definition:

Information regarding the crash. It indicates crash is active or inactive.

Functional requirements:

Initial value: 0H

Error identifier: -

Physical range: 0H … 1H

Conversion:

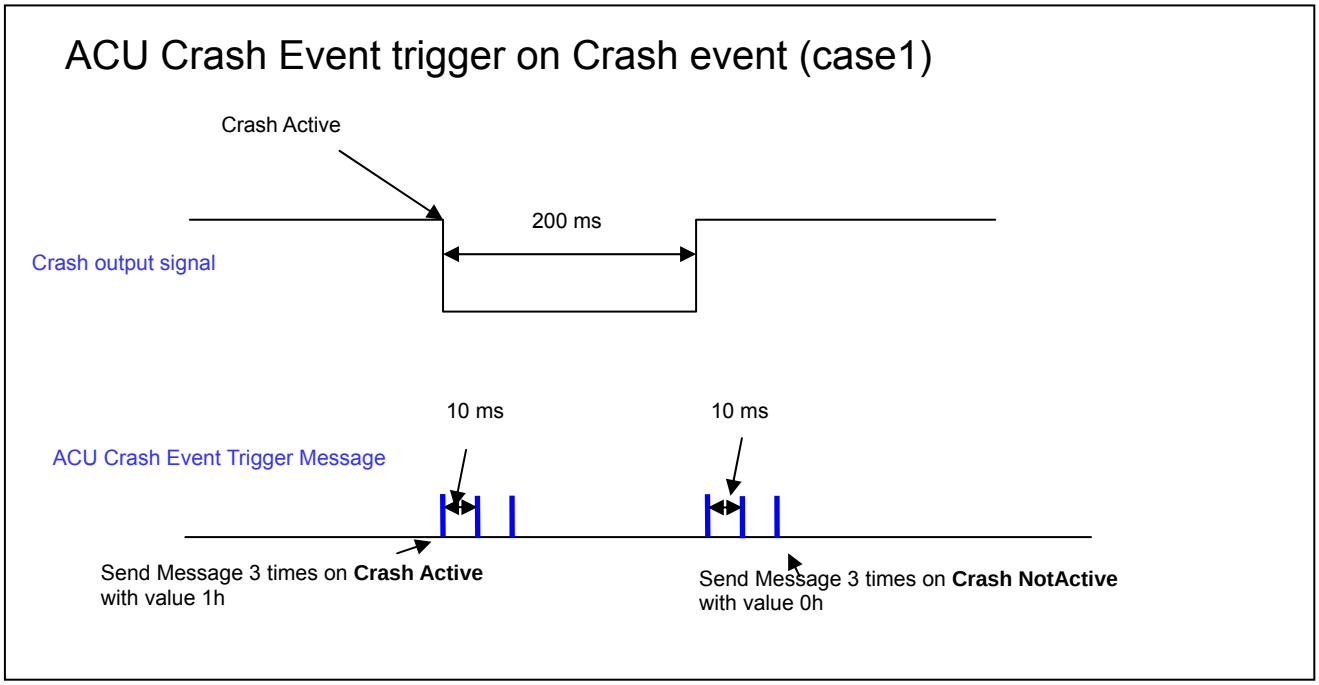
Value	Function
0	Crash Active time is expired (Crash is Inactive)
1	Crash Active time started (Crash Detected)

Receiver of signal and signal features required by the receiver:

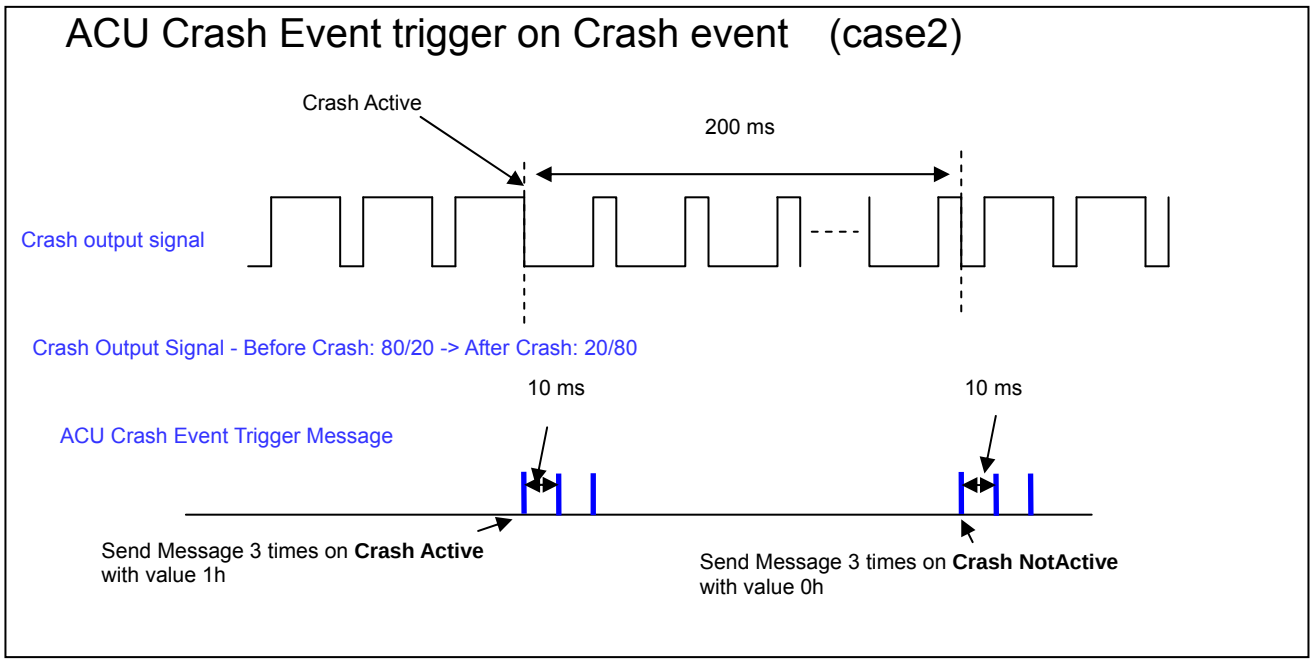
ODS

Note:

Trigger Condition (case 1):



Trigger Condition (case2):



6.2.51 ACU4 Message

Message: ACU4	Identifier: 02C0h

Signal Label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
CF_SWL_Ind	System Warning Lamp Indication	0	2	01H	-
CF_TTL_Ind	Telltale Lamp Indication	2	2	01H	-
CF_SBR_Ind	Seat Belt Reminder Indication	4	2	01H	-
Free	Free	6	58	00H	-

Memory layout:

Free				56
Free				48
Free				40
Free				32
Free				24
Free				16
Free				8
Free	CF_SBR_Ind	CF_TTL_Ind	CF_SWL_Ind	0

Transmission parameters - Conditions

System	ACU
Output period	10 ms
Output period tolerance	±2ms
Latency	max. 2ms
Transmit condition	Send ACU Diagnostic result
Remote operation	no
Message Time out	500 ms
Message Validity	IGN1
Phase relationship to another message	no

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_SWL_Ind	**System Warning Lamp Indication**	**ACU4**	**02C0H**	**0**	**2**

Signal definition:

This signal means information regarding ACU diagnostic information result & discrimination.

Functional requirements:

Initial value: 01H

Error identifier: -

Physical range: 0H … 3H

Conversion:

Value	Function
0H	Warning Lamp on
1H	Warning Lamp off
2H	Warning Lamp flash
3H	Not used

Receiver of signal and signal features required by the receiver:

CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_TTL_Ind	**Telltale Lamp Indication**	**ACU4**	**02C0H**	**2**	**2**

Signal definition:

This signal means information regarding Occupant status.

Functional requirements:

Initial value: 01H

Error identifier: -

Physical range: 0H … 3H

Conversion:

Value	Function
0H	Telltale Lamp on
1H	Telltale Lamp off
2H	Telltale Lamp flash
3H	Not used

Receiver of signal and signal features required by the receiver:

CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_SBR_Ind	**Seat Belt Reminder Indication**	**ACU4**	**02C0H**	**4**	**2**

Signal definition:

This signal means information regarding status of Passenger Seat Belt.

Functional requirements:

Initial value: 01H

Error identifier: -

Physical range: 0H … 3H

Conversion:

Value	Function
0H	SBR Lamp on
1H	SBR Lamp off
2H	SBR Lamp flash
3H	Not used

Receiver of signal and signal features required by the receiver:

CLU

Note:

6.2.52 ACU5 Message

Message: ACU5	Identifier: 05A2h

Signal Label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
CF_SWL_Ind	System Warning Lamp Indication	0	2	01H	-
CF_Acu_FltStat	Fault Status	2	2	02H	-
Free	Free	3	5	00H	-
CF_Acu_Dtc	DTC Byte	8	16	00H	-
CF_Acu_NumOfFlt	Number of fault	24	8	00H	-

Memory layout:

CF_Acu_NumOfFlt							24
CF_Acu_Dtc (MSB)							16
CF_Acu_Dtc (LSB)							8
Free	Free	Free	Free	Free	CF_Acu_FltStat	CF_SWL_Ind	0

Transmission parameters - Conditions

System	ACU
Output period	1 s
Output period tolerance	100 ms
Latency	max. 5 ms
Transmit condition	Send ACU Diagnostic result(when crash output signal is issued or ACU is entered to extended diagnostic mode, stop to send message)
Remote operation	no
Message Time out	no
Message Validity	IGN1
Phase relationship to another message	no

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_SWL_Ind	**System Warning Lamp Indication**	**ACU5**	**05A2H**	**0**	**2**

Signal definition:

This signal means information regarding ACU diagnostic information result & discrimination.

Functional requirements:

Initial value: 01H

Error identifier: -

Physical range: 00H … 03H

Conversion:

Value	Function
00H	Warning Lamp on
01H	Warning Lamp off
02H	Warning Lamp flash
03H	Not used

Receiver of signal and signal features required by the receiver:

CUbiS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Acu_FltStat	**Fault Status**	**ACU5**	**05A2H**	**2**	**2**

Signal definition:

This signal means information regarding fault status, whether it is an active fault or not.

Functional requirements:

Initial value: 02H

Error identifier: -

Physical range: 00H … 03H

Conversion:

Value	Function
00H	Fault status is active
01H	Fault status is historic
02H	Fault does not exist
03H	Not used

Receiver of signal and signal features required by the receiver:

CUbiS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Acu_Dtc	**DTC Byte**	**ACU5**	**05A2H**	**8**	**16**

Signal definition:

This signal means information regarding a diagnostic trouble code number.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: -

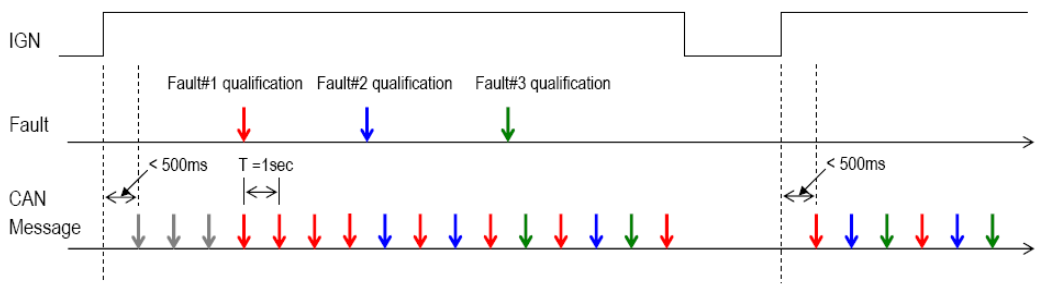
Conversion: (PH) = (HEX)

Receiver of signal and signal features required by the receiver:

CUbiS

Note:

DTC Transmission order is as following.



Gray color arrow ↓	ACU5 Message which does not contain Fault contents
Red color arrow ↓	ACU5 Message which contains a Fault #1 contents
Blue color arrow ↓	ACU5 Message which contains a Fault #2 contents
Green color arrow ↓	ACU5 Message which contains a Fault #3 contents

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Acu_NumOfFlt	**Number of fault**	**ACU5**	**05A2H**	**24**	**8**

Signal definition:

This signal means information regarding number of fault in ACU memory, including active and historic faults.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00H ... FFH

Conversion: (PH) = (HEX)

Receiver of signal and signal features required by the receiver:

CUbiS

Note:

6.2.53 ODS1 Message

Message: ODS1	Identifier: 05FAh

Signal Label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
Free	Free	0	1	00H	-
CF_Ods_PrcCmd	Command in process	1	1	00H	-
Free	Free	2	1	00H	-
CF_Ods_BtsFail	Belt Tension Sensor Failure	3	1	00H	-
CF_Ods_AcuRcvSN	ACU_SN_Received	4	1	00H	-
CF_Ods_EolCal	Seat EOL Calibration Flag	5	1	00H	-
CF_Ods_PsFail	Pressure Sensor Failure	6	1	00H	-
CF_Ods_EcuFail	PODS-B ECU Failure	7	1	00H	-
CF_Ods_WgtStat	Weight status	8	1	00H	-
Free	Free	9	7	00H	-
CF_Ods_OccStat	Occupancy Status	16	1	00H	-
Free	Free	17	15	00H	-
CR_Wcs_ErrStat	Self Diagnostic Status byte	32	8	00H	-
CR_Wcs_ClassStat	Occupant Classification Status	40	8	04H	-
Free	Free	48	16	00H	-

Memory layout:

Free								56
Free								48
CR_Wcs_ClassStat								40
CR_Wcs_ErrStat								32
Free								24
Free							CF_Ods_ OccStat	16
Free							CF_Ods_ WgtStat	8
CF_Ods_E cuFail	CF_Ods_P sFail	CF_Ods_E olCal	CF_Ods_A cuRcvSN	CF_Ods_B tsFail	Free	CF_Ods_P rcCmd	Free	0

Transmission parameters - Conditions

System	ODS
Output period	1000 ms
Output period tolerance	± 100 ms
Latency	max. 5 ms
Transmit condition	Ignition Power ON
Remote operation	no
Message Time out	no
Message Validity	IGN1
Phase relationship to another message	no

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Ods_PrcCmd	**Command in process**	**ODS1**	**05FAH**	**1**	**1**

Signal definition:

Following a request to re-zero the ODS empty seat offset or clear ODS faults, an event driven ODS status message, with bit 1 set to a '1', will be transmitted to the ACU within 100 milliseconds. The Command In-process bit indicates a request has been received, and the command is in process. While the command is in process, normal ODS status messages will be transmitted at the normal 1-second interval, but the In-process bit will remain set. Following the completion of the command, a second event driven ODS status message, with bit 1 cleared to a '0', will be transmitted to the ACU within 100 milliseconds. The Command In-Process bit will not be set for more than 3 consecutive ODS status messages.

There is no specific phase relationship between the output and any other signal.

Functional requirements:

Initial value: 00H

Error identifier: --

Physical range: 0 … 1 = 00H … 01H

Conversion:

Value	Function
00H	No command in process
01H	Command in process

Receiver of signal and signal features required by the receiver:

ACU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Ods_BtsFail	**Belt Tension Sensor Failure**	**ODS1**	**05FAH**	**3**	**1**

Signal definition:

Bit 3 will be set to a '**1**' when belt tension sensor fault condition is detected, and it will not remain latched for the duration of current cycle. If the BTS fault is cleared during the ignition cycle, Bit3 will be set to '0'. Otherwise it will be '**0**'

There is no specific phase relationship between the output and any other signal.

Functional requirements:

Initial value: 00H

Error identifier: --

Physical range: 0 … 1 = 00H … 01H

Conversion:

Value	Function
00H	NO Belt Tension Sensor Fault exists
01H	Belt Tension Sensor Fault exists

Receiver of signal and signal features required by the receiver:

ACU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Ods_AcuRcvSN	**ACU_SN_Received**	**ODS1**	**05FAH**	**4**	**1**

Signal definition:

Immediately following initialization, bit 4 is cleared to a ‘0’. Bit 4 will remain cleared until a valid ACU Serial Number is received, stored in product memory and verified. Upon completion, the ACU S/N Receipt status bit will be set to a ‘1’.

There is no specific phase relationship between the output and any other signal.

Functional requirements:

Initial value: 00H

Error identifier: --

Physical range: 0 … 1 = 00H … 01H

Conversion:

Value	Function
00H	ACU Serial Number not received
01H	ACU Serial Number Received

Receiver of signal and signal features required by the receiver:

ACU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Ods_EolCal	**Seat EOL Calibration Flag**	**ODS1**	**05FAH**	**5**	**1**

Signal definition:

Bit 5 is derived from the “Seat EOL Calibration Status” byte located in EEPROM at address $0631. Bit 5 will be ‘0’ whenever the “Seat EOL Calibration Status” is equal to $FF, or whenever a “Seat EOL Calibration” is in progress. Otherwise, bit 5 will be ‘1’, indicating that the seat has been calibrated at the seat assembly end-of-line.

There is no specific phase relationship between the output and any other signal.

Functional requirements:

Initial value: 00H

Error identifier: --

Physical range: 0 … 1 = 00H … 01H

Conversion:

Value	Function
00H	No re-zero request.
01H	Request to re-zero the empty seat offset

Receiver of signal and signal features required by the receiver:

ACU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Ods_PsFail	**Pressure Sensor Failure**	**ODS1**	**05FAH**	**6**	**1**

Signal definition:

Bit 6 will be set to a ‘1’ when a Pressure Signal Fault-Active condition is detected. This bit will remain latched for the duration the current ignition cycle. Otherwise, it will be ‘0’.

There is no specific phase relationship between the output and any other signal.

Functional requirements:

Initial value: 00H

Error identifier: --

Physical range: 0 … 1 = 00H … 01H

Conversion:

Value	Function
00H	No Pressue Sensor Fault exists
01H	Pressure Sensor Fault exists

Receiver of signal and signal features required by the receiver:

ACU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Ods_EcuFail	**PODS-B ECU Failure**	**ODS1**	**05FAH**	**7**	**1**

Signal definition:

Information of Crash event with Passenger Front 1st stage /Side Airbag No-Inhibition.

There is no specific phase relationship between the output and any other signal.

Functional requirements:

Initial value: 00H

Error identifier: --

Physical range: 0 … 1 = 00H … 01H

Conversion:

Value	Function
00H	No ECU Fault exists
01H	ECU Fault exists

Receiver of signal and signal features required by the receiver:

ACU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Ods_WgtStat	**Weight status**	**ODS1**	**05FAH**	**8**	**1**

Signal definition:

The “Occupant Weight Status” byte indicates that the occupant is below the “Allow” threshold ($00) or the occupant is the above the “Allow” threshold ($01).

There is no specific phase relationship between the output and any other signal.

Functional requirements:

Initial value: 00H

Error identifier: --

Physical range: 0 … 1 = 00H … 01H

Conversion:

Value	Function
00H	Occupant below “allow” threshold
01H	Occupant above “allow” threshold

Receiver of signal and signal features required by the receiver:

ACU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Ods_OccStat	**Occupancy Status**	**ODS1**	**05FAH**	**16**	**1**

Signal definition:

The " Seat Occupation Status" byte indicates that the seat is empty($00) or occupied($01).

There is no specific phase relationship between the output and any other signal.

Functional requirements:

Initial value: 00H

Error identifier: --

Physical range: 0 … 1 = 00H … 01H

Conversion:

Value	Function
00H	Seat not occupied
01H	Seat Occupied

Receiver of signal and signal features required by the receiver:

ACU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_Wcs_ErrStat	**Self Diagnostic Status byte**	**ODS1**	**05FAH**	**32**	**8**

Signal definition:

CR_Wcs_ErrStat signal describes WCS system error that is diagnosed by itself . WCS's Self Diagnostic Status explains 6 kinds of fault.

Bit	Fault List	SET	CLEAR
0	Com Error	Active	Not Active
1	WCS Sensor Defect	Active	Not Active
2	WCS ECU Defect	Active	Not Active
3	IGN HIGH	Active	Not Active
4	IGN LOW	Active	Not Active
5	REQUIRED WEIGHT CHECK	Active	Not Active
6	Reserved	-	-
7	Reserved	-	-

Com Error:

If WCS recognize problems related to communication line or invalid message from other transmit unit , WCS set this bit , sends the WCS_ERR_STATUS signal to ACU and notifies the fault.

WCS Sensor Defect:

If WCS sensors have some errors , WCS set this bit , sends the WCS_ERR_STATUS signal to ACU and notifies the fault.

WCS ECU Defect:

If WCS ECU have some errors , WCS set this bit , sends the WCS_ERR_STATUS signal to ACU and notifies the fault.

IGN HIGH:

If Ingition Voltage is higher than normal range in Spec. , IGN HIGH fault is occurred. Then, WCS set this bit, sends the WCS_ERR_STATUS signal to ACU and notifies the fault.

IGN LOW:

If Ingition Voltage is lower than normal range in Spec. , IGN LOW fault is occurred. Then, WCS set this bit, sends the WCS_ERR_STATUS signal to ACU and notifies the fault.

REQUIRED WEIGHT CHECK:

Warning about the Function of WCS system

Functional requirements:

Initial value:	00H
Error identifier:	--
Physical range:	0 … 63 = 00H … 3FH
Conversion:	(PH) = (HEX)

Receiver of signal and signal features required by the receiver:

ACU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_Wcs_ClassStat	**Occupant Classification Status**	**ODS1**	**05FAH**	**40**	**8**

Signal definition:

CR_Wcs_ClassStat signal describes Occupant Classification Status. There are 4 types of the Occupant Classification status.

Functional requirements:

Initial value: 04H

Error identifier: --

Physical range: 0 … 4 = 00H … 04H

Conversion:

Value	Function
00H	Empty (Class0)
01H	Child (Class1)
02H	Adult (Class2)
04H	Indeterminate

Receiver of signal and signal features required by the receiver:

ACU

Note:

6.2.54 ODS2 Message

Message: ODS2	Identifier: 05FBh

Signal Label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
CR_Ods_SerNum0	ODS_SerialNumber Byte 0	0	8	Current value	-
CR_Ods_SerNum1	ODS_SerialNumber Byte 1	8	8	Current value	-
CR_Ods_SerNum2	ODS_SerialNumber Byte 2	16	8	Current value	-
CR_Ods_SerNum3	ODS_SerialNumber Byte 3	24	8	Current value	-
CR_Ods_SerNum4	ODS_SerialNumber Byte 4	32	8	Current value	-
CR_Ods_SerNum5	ODS_SerialNumber Byte 5	40	8	Current value	-
CR_Ods_SerNum6	ODS_SerialNumber Byte 6	48	8	Current value	-
CR_Ods_SerNum7	ODS_SerialNumber Byte 7	56	8	Current value	-

Memory layout:

CR_Ods_SerNum7	56
CR_Ods_SerNum6	48
CR_Ods_SerNum5	40
CR_Ods_SerNum4	32
CR_Ods_SerNum3	24
CR_Ods_SerNum2	16
CR_Ods_SerNum1	8
CR_Ods_SerNum0	0

Transmission parameters - Conditions

System	ODS
Output period	1000 ms until ODS_SN_Received_Flag is set to 1 in ACU1 message
Output period tolerance	± 100 ms
Latency	max. 5 ms
Transmit condition	Ignition Power ON
Remote operation	no
Message Time out	no
Message Validity	IGN1
Phase relationship to another message	no

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_Ods_SerNum0	**ODS_SerialNumber Byte 0**	**ODS2**	**05FBH**	**0**	**8**
CR_Ods_SerNum1	**ODS_SerialNumber Byte 1**	**ODS2**	**05FBH**	**8**	**8**
CR_Ods_SerNum2	**ODS_SerialNumber Byte 2**	**ODS2**	**05FBH**	**16**	**8**
CR_Ods_SerNum3	**ODS_SerialNumber Byte 3**	**ODS2**	**05FBH**	**24**	**8**
CR_Ods_SerNum4	**ODS_SerialNumber Byte 4**	**ODS2**	**05FBH**	**32**	**8**
CR_Ods_SerNum5	**ODS_SerialNumber Byte 5**	**ODS2**	**05FBH**	**40**	**8**
CR_Ods_SerNum6	**ODS_SerialNumber Byte 6**	**ODS2**	**05FBH**	**48**	**8**
CR_Ods_SerNum7	**ODS_SerialNumber Byte 7**	**ODS2**	**05FBH**	**56**	**8**

Signal definition:

This message will contain the ODS Serial Number, which will not exceed 8 bytes.
The ODS will continue to transmit the ODS Serial Number message whenever the “ODS S/N Received” bit is equal to a ‘0’ in the ODS Status message.

There is no specific phase relationship between the output and any other signal.

Functional requirements:

Initial value: Current value

Error identifier: --

Physical range: 0..255= 00H .. FFH

Conversion: (PH) = (HEX)

Receiver of signal and signal features required by the receiver:

ACU

Note:

6.2.55 ODS3 Message

Message: ODS3	Identifier: 05FCh

Signal Label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
CR_Ods_ID	ODS_ ID	0	8	Current value	-
CR_Ods_Chksum_H	Cal Checksum High Byte	8	8	Current value	-
CR_Ods_Chksum_L	Cal Checksum Low Byte	16	8	Current value	-
CR_Ods_RomID_H	ROM ID High Byte	24	8	Current value	-
CR_Ods_RomID_L	ROM ID Low Byte	32	8	Current value	-

Memory layout:

CR_Ods_RomID_L	32
CR_Ods_RomID_H	24
CR_Ods_Chksum_L	16
CR_Ods_Chksum_H	8
CR_Ods_ID	0

Transmission parameters - Conditions

System	ODS
Output period	1000 ms until ODS_ID_Received_Flag is set to 1 in ACU1 message
Output period tolerance	± 100 ms
Latency	max. 5 ms
Transmit condition	Ignition Power ON
Remote operation	no
Message Time out	no
Message Validity	IGN1
Phase relationship to another message	no

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_Ods_ID	**ODS_ ID**	**ODS3**	**05FCH**	**0**	**8**

Signal definition:

Information of Vehicle seat ID as defined by customer.

There is no specific phase relationship between the output and any other signal.

Functional requirements:

Initial value: Current value

Error identifier: --

Physical range: 0 ... 255 = 00H … FFH

Conversion: (PH) = (HEX)

Receiver of signal and signal features required by the receiver :

ACU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_Ods_Chksum_H	**Cal Checksum High Byte**	**ODS3**	**05FCH**	**8**	**8**

Signal definition:

The CAL Checksum High Byte contains upper 8 bit field of production ODS ECU Calibration Checksum Information.

There is no specific phase relationship between the output and any other signal.

Functional requirements:

Initial value: Current value

Error identifier: --

Physical range: 0 ... 255 = 00H … FFH

Conversion: (PH) = (HEX)

Receiver of signal and signal features required by the receiver :

ACU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_Ods_Chksum_L	**Cal Checksum Low Byte**	**ODS3**	**05FCH**	**16**	**8**

Signal definition:

The CAL Checksum Low Byte contains lower 8 bit field of production ODS ECU Calibration Checksum Information.

There is no specific phase relationship between the output and any other signal.

Functional requirements:

Initial value: Current value

Error identifier: --

Physical range: 0 ... 255 = 00H … FFH

Conversion: (PH) = (HEX)

Receiver of signal and signal features required by the receiver :

ACU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_Ods_RomID_H	**ROM ID High Byte**	**ODS3**	**05FCH**	**24**	**8**

Signal definition:

The ROM ID High Byte contains upper 8 bit field of production ROM ID information

There is no specific phase relationship between the output and any other signal.

Functional requirements:

Initial value: Current value

Error identifier: --

Physical range: 0 ... 255 = 00H … FFH

Conversion: (PH) = (HEX)

Receiver of signal and signal features required by the receiver :

ACU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_Ods_RomID_L	**ROM ID Low Byte**	**ODS3**	**05FCH**	**32**	**8**

Signal definition:

The ROM ID Low Byte contains lower 8 bit field of production ROM ID information

There is no specific phase relationship between the output and any other signal.

Functional requirements:

Initial value: Current value

Error identifier: --

Physical range: 0 ... 255 = 00H … FFH

Conversion: (PH) = (HEX)

Receiver of signal and signal features required by the receiver :

ACU

Note:

6.2.56 RPAS1 Message

Message: RPAS1	Identifier: 0548h

Signal Label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
CF_Rpas_IndL	Left Warning indicator Command	0	3	00H	-
CF_Rpas_IndCL	Center Left Warning indicator Command	3	3	00H	-
Free	Free	6	2	00H	-
CF_Rpas_IndCR	Center Right Warning indicator Command	8	3	00H	-
CF_Rpas_IndR	Right Warning indicator Command	11	3	00H	-
Free	Free	14	18	00H	-

Memory layout:

Free			24
Free			16
Free	CF_Rpas_IndR	CF_Rpas_IndCR	8
Free	CF_Rpas_IndCL	CF_Rpas_IndL	0

Transmission parameters - Conditions

System	RPAS
Output period	100 ms
Output period tolerance	± 10ms
Latency	Max. 10ms
Remote operation	no
Message Time out	1000ms
Message Validity	IGN1
Phase relationship to another message	no

***NOTE : This message is for the "HM" vehicle only.**

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Rpas_IndL	**Left Warning indicator Command**	**RPAS1**	**0548H**	**0**	**3**

Signal definition:

CF_Rpas_IndL shall display of RPAS(Rear Parking Assist System)'s Left information.

Functional requirement :

Initial value : 00H

Error identifier : -

Physical range: 00..04H

Conversion:

CF_Rpas_IndL	Function
00H	OFF
01H	1st Warning
02H	2nd Warning
03H	3rd Warning
04H	Malfunction
05H – 07H	Reserved

Receiver of signal and signal features required by the receiver :

CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Rpas_IndCL	**Center Left Warning indicator Command**	**RPAS1**	**0548H**	**3**	**3**

Signal definition:

CF_Rpas_IndCL shall display of RPAS(Rear Parking Assist System)'s Center Left information.

Functional requirement :

Initial value : 00H

Error identifier : -

Physical range: 00..04H

Conversion:

CF_Rpas_IndCL	Function
00H	OFF
01H	1st Warning
02H	2nd Warning
03H	3rd Warning
04H	Malfunction
05H – 07H	Reserved

Receiver of signal and signal features required by the receiver :

CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Rpas_IndCR	**Center Right Warning indicator Command**	**RPAS1**	**0548H**	**8**	**3**

Signal definition:

CF_Rpas_IndCR shall display of RPAS(Rear Parking Assist System)'s Center Right information.

Functional requirement :

Initial value : 00H

Error identifier : -

Physical range: 00..04H

Conversion:

CF_Rpas_IndCR	Function
00H	OFF
01H	1st Warning
02H	2nd Warning
03H	3rd Warning
04H	Malfunction
05H – 07H	Reserved

Receiver of signal and signal features required by the receiver :

CLU

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Rpas_IndR	**Right Warning indicator Command**	**RPAS1**	**0548H**	**11**	**3**

Signal definition:

CF_Rpas_IndR shall display of RPAS(Rear Parking Assist System)'s Right information.

Functional requirement :

Initial value : 00H

Error identifier : -

Physical range: 00..04H

Conversion:

CF_Rpas_IndR	Function
00H	OFF
01H	1st Warning
02H	2nd Warning
03H	3rd Warning
04H	Malfunction
05H – 07H	Reserved

Receiver of signal and signal features required by the receiver :

CLU

Note:

6.2.57 LDWS1 Message

Message: LDWS1	Identifier: 03A0H

%%

Signal label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
CF_Ldws_SysStat	LDWS System Status	0	3	00H	-
CF_Ldws_LHWarning	Left Lane Departure Warning Status	3	2	00H	-
CF_Ldws_RHWarning	Right Lane Departure Warning Status	5	2	00H	-
CF_Ldws_HapWarning	Haptic Warning Device Operation Command	7	1	00H	-
CF_Ldws_SpdExceed	Vehicle Speed Exceed given Threshold Speed	8	1	00H	-
CF_Ldws_RecLL	Status of Recognition of Left Line	9	1	00H	-
CF_Ldws_RecRL	Status of Recognition of Right Line	10	1	00H	-
CF_Ldws_TurnSigLh	Status of Left Turn Signal On/Off	11	1	00H	-
CF_Ldws_TurnSigRh	Status of Right Turn Signal On/Off	12	1	00H	-
CF_Ldws_FunStop	LDWS Function is stopped by Wiper High Switch engagement	13	1	00H	-
Free	Free	14	50	00H	-

Memory layout:

Free							56
Free							48
Free							40
Free							32
Free							24
Free							16
Free	CF_Ldws_FunStop	CF_Ldws_TurnSigRh	CF_Ldws_TurnSigLh	CF_Ldws_RecRL	CF_Ldws_RecLL	CF_Ldws_SpdExceed	8
CF_Ldws_HapWarning	CF_Ldws_RHWarning	CF_Ldws_LHWarning		CF_Ldws_SysStat			0

Transmission parameters - Conditions

System	LDWS
Output period	20 ms
Output period tolerance	± 5 ms
Latency	max. 5 ms
Remote operation	no
Message Time out	500ms
Message Validity	IGN1
Phase relationship to another message	no

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit lnd.
CF_Ldws_SysStat	**LDWS System Status**	**LDWS1**	**03A0H**	**0**	**3**

Signal definition:

LDWS indicates its status using this signal. After ignition On, LDWS System changes its status whenever system state is changed by external or internal event such like system ON, Lane recognition and system fail.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 07H

Conversion:

CF_Ldws_SysStat	Function
00H	System Ready
01H	System On
02H	System On & Lane Recognize
03H	System On & Lane Unrecognized
04H~06H	Reserved
07H	System Fail

Receiver of signal and signal features required by the receiver:

CLU, PSB

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit lnd.
CF_Ldws_LHWarning	**Left Lane Departure Warning Status**	**LDWS1**	**03A0H**	**3**	**2**

Signal definition:

This signal indicate left lane departure warning status such like first step warning, second step warning.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 03H

Conversion:

CF_Ldws_LHWarning	Function
00H	None Warning is generated
01H	Lane departure first step warning engaged
02H	Lane departure second step warning engaged
03H	Reserved

Receiver of signal and signal features required by the receiver:

CLU, PSB

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit lnd.
CF_Ldws_RHWarning	**Right Lane Departure Warning Status**	**LDWS1**	**03A0H**	**5**	**2**

Signal definition:

This signal indicate right lane departure warning status such like first step warning, second step warning.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 03H

Conversion:

CF_Ldws_RHWarning	Function
00H	None Warning is generated
01H	Lane departure first step warning engaged
02H	Lane departure second step warning engaged
03H	Reserved

Receiver of signal and signal features required by the receiver:

CLU, PSB

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Ldws_HapWarning	**Haptic Warning Device Operation Command**	**LDWS1**	**03A0H**	**7**	**1**

Signal definition:

LDWS command operation of haptic device via this signal.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 01H

Conversion:

CF_Ldws_HapWarning	Function
00H	No operation
01H	Operate haptic warning

Receiver of signal and signal features required by the receiver:

PSB

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit lnd.
CF_Ldws_SpdExceed	**Vehicle Speed Exceed given Threshold Speed**	**LDWS1**	**03A0H**	**8**	**1**

Signal definition:

This signal shows that vehicle speed exceed given threshold speed which is used as reference speed of lane recognition from cluster.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 01H

Conversion:

CF_Ldws_SpdExceed	Function
00H	Under threshold speed
01H	Over threshold speed

Receiver of signal and signal features required by the receiver:

LDWS Test Tools

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit lnd.
CF_Ldws_RecLL	**Status of Recognition of Left Line**	**LDWS1**	**03A0H**	**9**	**1**

Signal definition:

This signal shows the status of recognition of left line.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 01H

Conversion:

CF_Ldws_RecLL	Function
00H	Left line unrecognized
01H	Left line recognized

Receiver of signal and signal features required by the receiver:

LDWS Test Tools

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit lnd.
CF_Ldws_RecRL	**Status of Recognition of Left Line**	**LDWS1**	**03A0H**	**10**	**1**

Signal definition:

This signal Status of Recognition of Right Line

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 01H

Conversion:

CF_Ldws_RecRL	Function
00H	Right line unrecognized
01H	Right line recognized

Receiver of signal and signal features required by the receiver:

LDWS Test Tools

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Ldws_TurnSigLh	**Status of Left Turn Signal On/Off**	**LDWS1**	**03A0H**	**11**	**1**

Signal definition:

This signal represents the status of left turn signal through body CAN.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 01H

Conversion:

CF_Ldws_TurnSigLh	Function
00H	OFF
01H	ON

Receiver of signal and signal features required by the receiver:

LDWS Test Tools

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit lnd.
CF_Ldws_TurnSigRh	**Status of Right Turn Signal On/Off**	**LDWS1**	**03A0H**	**12**	**1**

Signal definition:

This signal represents the status of right turn signal through body CAN.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 01H

Conversion:

CF_Ldws_TurnSigRh	Function
00H	OFF
01H	ON

Receiver of signal and signal features required by the receiver:

LDWS Test Tools

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit lnd.
CF_Ldws_FunStop	**LDWS Function is stopped by Wiper High Switch engagement**	**LDWS1**	**03A0H**	**13**	**1**

Signal definition:

This signal indicates that LDWS unit receive “Wiper High Switch” engage signal from cluster and stop LDWS normal operation.

Functional requirements:

Initial value: 00H

Error identifier: -

Physical range: 00 ... 01H

Conversion:

CF_Ldws_FunStop	Function
00H	LDWS operate at normal condition
01H	LDWS function is stopped by Wiper High mode

Receiver of signal and signal features required by the receiver:

CLU

Note:

6.2.58 DCT1 Message

Message: DCT1	Identifier: 0330h

@@ ## %%

Signal Label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
CF_Tcu_CltStat	DCT clutch status	0	2	00H	-
CF_Tcu_ChgInhAC	Inhibit AC status change (reserved)	2	1	00H	-
CF_Tcu_TqIncReq	Request for Torque Increase	3	1	00H	-
Free	Free	4	4	00H	-
CR_Tcu_CreepTq	Pre-control torque for creeping (reserved)	8	10	200H	-
Free	Free	18	6	00H	-
CR_Tcu_TqDec	DCT TCU requested engine torque decrease	24	8	FFH	FFH
CR_Tcu_TqInc	DCT TCU requested engine torque increase	32	8	00H	00H
CR_Tcu_ShiftTq	Pre-control torque for shifting	40	~~10~~ 8	200H	-
Free	Free	48	8	00H	-
CF_Tcu_Alive2	Alive Counter	56	4	00H	-
CF_Tcu_ChkSum2	Checksum	60	4	00H	-

Memory layout:

CF_Tcu_ChkSum2		CF_Tcu_Alive2		56
Free				48
CR_Tcu_ShiftTq				40
CR_Tcu_TqInc				32
CR_Tcu_TqDec				24
Free			CR_Tcu_CreepTq (MSB)	16
CR_Tcu_CreepTq (LSB)				8
Free	CF_Tcu_TqIncReq	CF_Tcu_ChgInhAC	CF_Tcu_CltStat	0

Transmission parameters - Conditions

System	TCU
Output period	10 ms
Output period tolerance	± 1ms
Latency	Max. 5ms
Remote operation	no
Message Time out	500ms
Message Validity	IGN1
Phase relationship to another message	no

***NOTE : This message is for the "DCT(Double Clutch T/M)" system applied vehicles only**

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Tcu_CltStat	**DCT clutch status**	**DCT1**	**0330H**	**0**	**2**

Signal definition:

Status of DCT clutches. This signal gives information about the frictional connection between the engine and the drive train.
There is no specific phase relationship between the output and any other signal.

Functional requirement :

Initial value : 00H

Error identifier : -

Physical range: 0..3 = 00H..03H

Conversion:

CF_Tcu_CltStat	Function
00H	Drivetrain (both clutches) open
01H	Odd Clutch slipping
02H	Even Clutch slipping
03H	1 clutch locked

Receiver of signal and signal features required by the receiver :

EMS

Note:

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Tcu_ChgInhAC	**Inhibit AC status change (reserved)**	**DCT1**	**0330H**	**2**	**1**

Signal definition:

Inhibit changes of engine torque. e.g. by changing status of the air condition.

Functional requirement :

Initial value : 00H

Error identifier : -

Physical range: 0..1 = 00H..01H

Conversion:

CF_Tcu_ChgInhAC	Function
00H	-
01H	Freeze AC clutch

Receiver of signal and signal features required by the receiver :

EMS

Note:

@@

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Tcu_TqIncReq	**Request for Torque Increase**	**DCT1**	**0330H**	**3**	**1**

Signal definition:

An Identifier of a DCT TCU controller for increasing torque intervention.
This bit is to prevent the triggering of unintended DCT TCU interventions.

Functional requirement :

Initial value : 00H

Error identifier : -

Physical range: 0..1 = 00H..01H

Conversion:

CF_Tcu_TqIncReq	Function
00H	Passive
01H	Torque increase controls

Receiver of signal and signal features required by the receiver :

EMS

Note:
In the case of a torque increase, following conditions must be fulfilled.
CF_Tcu_TqIncReq = 1 and CR_Tcu_TqInc > 00H.

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_Tcu_CreepTq	**Pre-control torque for creeping (reserved)**	**DCT1**	**0330H**	**8**	**10**

Signal definition:

During creep mode (engine in idle, brake pedal not pressed, gear engaged) clutch torque will be applied. In order to support the engine's idle controller CR_Tcu_CreepTq gives the information how much clutch torque will be applied within the next 50 ms.

Functional requirement :

Initial value : 200H

Error identifier : -

Physical range: -512 .. 511 Nm = 000H .. 3FFH

Conversion: (PH) = (HEX) – 512 [Nm]

Receiver of signal and signal features required by the receiver :

EMS

Note:

@@

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_Tcu_TqDec	**DCT TCU requested engine torque decrease**	**DCT1**	**0330H**	**24**	**8**

Signal definition:

The DCT TCU requests a torque reduction via the signal CR_Tcu_TqDec to the EMS.

The requested torque CR_Tcu_TqDec refers to a maximum torque TQ_STND. This conversion into a physical quantity provides a range of TQ_STND of 0..99.6094%.

Functional requirement :

If there is no intervention, the passive value is transferred.

Passive: FFH

Initial value: FFH

Physical range: 0..99.6094% = 00H .. FFH

Conversion: (PH) = 0.390625 * (HEX) [%]
00H: Max. Decrease;
FFH: No Decrease

Receiver of signal and signal features required by the receiver :

EMS

Note:

@@

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_Tcu_TqInc	**DCT TCU requested engine torque increase**	**DCT1**	**0330H**	**32**	**8**

Signal definition:

The DCT TCU requests a torque increase via the signal CR_Tcu_TqInc to the EMS.

The requested torque CR_Tcu_TqInc refers to a maximum torque TQ_STND. This conversion into a physical quantity provides a range of TQ_STND of 0..99.6094%.

Functional requirement :

If there is no intervention, the passive value is transferred.

Passive: 00H

Initial value: 00H

Physical range: 0..99.6094% = 00H .. FFH

Conversion: (PH) = 0.390625 * (HEX) [%]
00H: No Increase;
FFH: Max. Increase

Receiver of signal and signal features required by the receiver :

EMS

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_Tcu_ShiftTq	**Pre-control torque for shifting**	**DCT1**	**0330H**	**40**	~~10~~ 8

Signal definition:

To ensure a torque increasing during gear shift within short time, ECU needs to build up a torque reserve determined by the pre-control torque.
Open throttle valve (more air) and automatic ignition angle reduction (within limited range based on engine characteristic) to ensure constant torque level.

The DCT TCU informs a pre-control torque via the signal CR_Tcu_ShiftTq to the EMS.
The requested torque CR_Tcu_ShiftTq refers to a maximum torque TQ_STND. This conversion into a physical quantity provides a range of TQ_STND of 0..99.6094%.

Functional requirement :

Initial value : ~~200H~~ 00H

Error identifier : 00H

Physical range: ~~-512 .. 511 Nm = 000H .. 3FFH~~
0..99.6094% = 00H .. FFH

Conversion: ~~(PH) = (HEX) - 512 [Nm]~~
(PH) = 0.390625 * (HEX) [%]
00H: No Increase
FFH: Max. Increase

Receiver of signal and signal features required by the receiver :

EMS

Note:

@@

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Tcu_Alive2	**Alive Counter**	**DCT1**	**0330H**	**56**	**4**

Signal definition:

This signal indicates the alive counter of DCT1 message

Functional requirement :

Initial value : 00H

Error identifier : -

Physical range: 0 ... 15 = 00H ... 0FH

Conversion: (PH) = (HEX)
0 … 15: after the counter is 15 it starts again at 0

Receiver of signal and signal features required by the receiver :

EMS, ESC

Note:

@@

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Tcu_ChkSum2	**Checksum**	**DCT1**	**0330H**	**60**	**4**

Signal definition:

This signal indicates Checksum of the signals CR_Tcu_TqDec and CR_Tcu_TqInc in DCT1 Message.

Functional requirement :

Initial value : 00H

Error identifier : -

Physical range: -

Conversion: (PH) = 10h - (least significant nibbles of (Byte0 + Byte1 + Byte2 + Byte3 + Byte4 + Byte5 + Byte6 + Byet7) + most significant nibbles of (Byte0 + Byte1 + Byte2 + Byte3 + Byte4 + Byte5 + Byte6))

Receiver of signal and signal features required by the receiver :

EMS, ESC

Note:

6.2.59 SPAS1 Message

Message: SPAS1	Identifier: 0390h

$$

Signal Label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
CF_Spas_Stat	SPAS Status	0	4	01H	-
Free	Free	4	4	00H	-
CR_Spas_StrAngCmd	Steering angle command	8	16	00H	7FFFH
Free	Free	24	8	00H	-
CF_Spas_AliveCnt	Message counter	32	8	00H	-
Free	Free	40	16	00H	-
CF_Spas_Chksum	Signal checksum	56	8	00H	-

Memory layout:

CF_Spas_Chksum		56
Free		48
Free		40
CF_Spas_AliveCnt		32
Free		24
CR_Spas_StrAngCmd (MSB)		16
CR_Spas_StrAngCmd (LSB)		8
Free	CF_Spas_Stat	0

Transmission parameters - Conditions

System	SPAS
Output period	20 ms
Output period tolerance	± 5ms
Latency	Max. 5ms
Transmit Condition	Power supply via EMS primary relay
Remote operation	no
Message Time out	500ms
Message Validity	IGN1
Phase relationship to another message	no

***NOTE : This message is for the "SPAS(Smart Parking Assist System)" applied vehicles only.**

$$

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Spas_Stat	**SPAS Status**	**SPAS1**	**0390H**	**0**	**4**

Signal definition:

This signal indicates the status of the SPAS steering activation machine.

Functional requirement :

Initial value : 01H

Error identifier : -

Physical range: 0..15 = 00H..0FH

Conversion:

CF_Spas_Stat	Function
00H	Reserved
01H	Initial value after ignition
02H	Request of a new start status after an abort of the MDPS
03H	StandBy status of the SPAS function. No error and no request
04H	First request toward an automatic steering
05H	Final request for an automatic steering
06H	Acknowledge an MDPS failure. This state is set for one cycle only
07H	Acknowledge an MDPS abort. This state is set for one cycle only
08H ~ 0FH	Reserved

Receiver of signal and signal features required by the receiver :

MDPS

Note:

$$

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_Spas_StrAngCmd	**Steering angle command**	**SPAS1**	**0390H**	**8**	**16**

Signal definition:

This value is used to set a steering wheel position target for the SPAS function. The signal is signed 16bits.

Functional requirement :

Initial value : 0000H

Error identifier : 7FFFH

Physical range: 0000H ... FFFFH

Conversion: (PH) = (HEX) x 0.1 (for 0< HEX < 32767) OR
(HEX - 65536) x 0.1 (for HEX > 32767)

Receiver of signal and signal features required by the receiver :

MDPS

Note:

$$

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Spas_AliveCnt	**Signal counter**	**SPAS1**	**0390H**	**32**	**8**

Signal definition:

This value is used to check the SPAS1 message is transmitted regularly and none have been lost.

Functional requirement :

Initial value : 00H

Error identifier : -

Physical range: 00H ... FFH

Conversion: (PH) = (HEX)

Receiver of signal and signal features required by the receiver :

MDPS

Note:

$$

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Spas_Chksum	**Signal checksum**	**SPAS1**	**0390H**	**56**	**8**

Signal definition:

This value is used to check the SPAS1 message is transmitted correctly.

Functional requirement :

Initial value : 00H

Error identifier : -

Physical range: 00H ... FFH

Conversion: (PH) = Byte (Byte0+Byte1+Byte2+Byte3+Byte4+Byte5+Byte6)

Receiver of signal and signal features required by the receiver :

MDPS

Note:

6.2.60 SPAS2 Message

Message: SPAS2	Identifier: 0505h

%%

Signal Label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
CF_Spas_HMI_Stat	HMI status for SPAS display	0	8	00H	-
CF_Spas_Disp	SPAS/PAS display ON/OFF status	8	2	00H	-
CF_Spas_FIL_Ind	Front inner left sensor warning indicator	10	3	00H	-
CF_Spas_FIR_Ind	Front inner right sensor warning indicator	13	3	00H	-
CF_Spas_FOL_Ind	Front outer left sensor warning indicator	16	3	00H	-
CF_Spas_FOR_Ind	Front outer right sensor warning indicator	19	3	00H	-
Free	Free	22	2	00H	-
CF_Spas_RIL_Ind	Rear inner left sensor warning indicator	24	3	00H	-
CF_Spas_RIR_Ind	Rear inner right sensor warning indicator	27	3	00H	-
Free	Free	30	2	00H	-
CF_Spas_ROL_Ind	Rear outer left sensor warning indicator	32	3	00H	-
CF_Spas_ROR_Ind	Rear outer right sensor warning indicator	35	3	00H	-
Free	Free	38	2	00H	-
CF_Spas_FI_Ind	Front inner sensor warning indicator	40	3	00H	-
CF_Spas_RI_Ind	Rear inner sensor warning indicator	43	3	00H	-
Free	Free	46	18	00H	-

Memory layout:

Free			56
Free			48
Free	CF_Spas_RI_Ind	CF_Spas_FI_Ind	40
Free	CF_Spas_ROR_Ind	CF_Spas_ROL_Ind	32
Free	CF_Spas_RIR_Ind	CF_Spas_RIL_Ind	24
Free	CF_Spas_FOR_Ind	CF_Spas_FOL_Ind	16
CF_Spas_FIR_Ind	CF_Spas_FIL_Ind	CF_Spas_Disp	8
CF_Spas_HMI_Stat			0

Transmission parameters - Conditions

System	SPAS
Output period	50 ms
Output period tolerance	± 5ms
Latency	Max. 5ms
Transmit Condition	Power supply via EMS primary relay
Remote operation	no
Message Time out	500ms
Message Validity	IGN1
Phase relationship to another message	no

***NOTE : This message is for the "SPAS(Smart Parking Assist System)" applied vehicles only.**

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Spas_HMI_Stat	**HMI status for SPAS display**	**SPAS2**	**0505H**	**0**	**8**

Signal definition:
This signal is used for SPAS HMI indicator (display).

Functional requirement :
Initial value : 00H
Error identifier : -
Physical range: 0 … 255 = 00H … FFH
Conversion:

CF_Spas_HMI_Stat	Function
00H	No Display
01H	Parking mode selection - right perpendicular
02H	Parking mode selection - left perpendicular
03H	Parking mode selection - right parallel
04H	Parking mode selection - left parallel
05H, 06H	Reserved
07H	Detecting parking space - right perpendicular
08H	Detecting parking space - left perpendicular
09H	Detecting parking space - right parallel
0AH	Detecting parking space - left parallel
0BH, 0CH	Reserved
0DH	Requesting stop of vehicle in perpendicular parking
0EH	Requesting Steering Wheel to left side in right perpendicular parking
0FH	Requesting Steering Wheel to right side in left perpendicular parking
10H	Reserved
11H	Finishing parking space - right perpendicular
12H	Finishing parking space - left perpendicular
13H	Finishing parking space - right parallel
14H	Finishing parking space - left parallel
15H, 16H	Reserved
17H	Automatic steering activation
18H	Reserved
19H	Requesting gear shift to forward during automatic steering activation
1AH	Requesting gear shift to backward during automatic steering activation
1BH	Reserved
1CH	Finishing automatic steering activation
1DH	Reserved
1EH	System auto-canceled
1FH	System failed
20H	Over speed of vehicle
21H~FFH	Reserved

Receiver of signal and signal features required by the receiver :
CLU

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Spas_Disp	**SPAS/PAS display ON/OFF status**	**SPAS2**	**0505H**	**8**	**2**

Signal definition:

This signal is used for SPAS/PAS display ON/OFF.
The value is sended to be based on the SPAS/PAS internal activation status, not the only switch status.
This means that the signal value should be OFF in case of SPAS/PAS internal activation status OFF, although SPAS/PAS switch is ON.

Functional requirement :

Initial value : 00H

Error identifier : -

Physical range: 0 … 3 = 00H … 03H

Conversion:

Value	Function		Explaination
	SPAS status	PAS status	
00H	OFF	OFF	No display
01H	OFF	ON	PAS display
02H	ON	OFF	SPAS display
03H	ON	ON	SPAS displaly

Receiver of signal and signal features required by the receiver :

CLU

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Spas_FIL_Ind	Front inner left sensor warning indicator	SPAS2	0505H	10	3
CF_Spas_FIR_Ind	Front inner right sensor warning indicator	SPAS2	0505H	13	3
CF_Spas_FOL_Ind	Front outer left sensor warning indicator	SPAS2	0505H	16	3
CF_Spas_FOR_Ind	Front outer right sensor warning indicator	SPAS2	0505H	19	3
CF_Spas_RIL_Ind	Rear inner left sensor warning indicator	SPAS2	0505H	24	3
CF_Spas_RIR_Ind	Rear inner right sensor warning indicator	SPAS2	0505H	27	3
CF_Spas_ROL_Ind	Rear outer left sensor warning indicator	SPAS2	0505H	32	3
CF_Spas_ROR_Ind	Rear outer right sensor warning indicator	SPAS2	0505H	35	3

Signal definition:

This signal is used for SPAS sensors waring indicator(display).

Functional requirement :

Initial value : 00H

Error identifier : -

Physical range: 0 … 7 = 00H … 07H

Conversion:

Value	Function
00H	OFF(No warning)
01H	1'st warning level
02H	2'nd warning level
03H	3'nd warning level (the closest status with obstacle)
04H~06H	Reserved
07H	Malfunction(sensor fail)

Receiver of signal and signal features required by the receiver :

CLU

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Spas_FI_Ind	**Front inner sensor warning indicator**	**SPAS2**	**0505H**	**40**	**3**
CF_Spas_RI_Ind	**Rear inner sensor warning indicator**	**SPAS2**	**0505H**	**43**	**3**

Signal definition:

This signal is used for SPAS sensors waring indicator(display).
CF_Spas_FI_Ind signal is to indicate the closest obstacle warning among front inner left & right sensors.
CF_Spas_RI_Ind signal is to indicate the closest obstacle warning among rear inner left & right sensors.

Functional requirement :

Initial value : 00H

Error identifier : -

Physical range: 0 … 7 = 00H … 07H

Conversion:

Value	Function
00H	OFF(No warning)
01H	1'st warning level
02H	2'nd warning level
03H	3'nd warning level (the closest status with obstacle)
04H~06H	Reserved
07H	Malfunction(sensor fail)

Receiver of signal and signal features required by the receiver :

CLU

Note:

6.2.61 VSM1 Message

Message: VSM1	Identifier: 0164h

%%

Signal Label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
CR_Esc_StrTqReq	Steering torque request	0	12	800H	FFFH
CF_Esc_Act	VSM active	12	1	0H	-
CF_Esc_CtrMode	VSM Control mode	13	3	00H	-
CF_Esc_Def	Information regarding the VSM "defective" Indication	16	1	00H	-
Free	Free	17	31	00H	-
CF_Esc_AliveCnt	ESC alive counter	48	4	00H	-
Free	Free	52	4	00H	-
CF_Esc_Chksum	Checksum	56	8	-	-

Memory layout:

CF_Esc_Chksum				56
Free		CF_Esc_AliveCnt		48
Free				40
Free				32
Free				24
Free			CF_Esc_Def	16
CF_Esc_CtrMode	CF_Esc_Act	CR_Esc_StrTqReq (MSB)		8
CR_Esc_StrTqReq (LSB)				0

Transmission parameters - Conditions

System	ESC
Output period	10 ms, Asynchronous mode
Output period tolerance	± 3ms
Latency	Max. 5ms
Transmit Condition	Power supply via EMS primary relay
Remote operation	no
Message Time out	500ms
Message Validity	IGN1
Phase relationship to another message	no

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_Esc_StrTqReq	**Steering torque request**	**VSM1**	**0164H**	**0**	**12**

Signal definition:

Requested additional Assist torque of MDPS gets from ESC to make vehicle more stable.

Functional requirement :

Initial value : 800H

Error Identifier : FFFH

Physical range : -20.48 ~ 20.46 Nm = 000H … FFEH

Conversion : (PH) = ((Hex)-800H) * 0.01 [Nm]

Relationship between signals:
ESC_StrTrqReq = 0 Nm (DST inactive)
→ ESC_DstAct = 0, ESC_DstCtrMode = 0
ESC_StrTrqReq < 0 Nm or ESC_StrTrqReq > 0 Nm (active DST intervention)
→ ESC_DstAct = 1, ESC_DstCtrMode = 1

Receiver of signal and signal features required by the receiver :

MDPS

Note:

PH > 0 : Left Direction (CCW)
PH < 0 : Right Direction (CW)

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Esc_Act	**VSM active**	**VSM1**	**0164H**	**12**	**1**

Signal definition:

ESC controller provides an information on VSM (ESC+MDPS) Active signal. It indicates VSM control is active or inactive.

Functional requirement :

Initial value : 0H

Error Identifier : -

Physical range: 0 … 1 = 00H … 01H

Conversion:

Value	Function
00H	VSM control inactive
01H	VSM control active

Receiver of signal and signal features required by the receiver :

MDPS

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Esc_CtrMode	**VSM Control mode**	**VSM1**	**0164H**	**13**	**3**

Signal definition:

Classify mode1 , mode2 and mode3 of torque overlay.
- Mode1 is sensor value overlay mode.
- Mode2 is output torque overlay mode.
- Mode3 is for an alternative mode for Mobis VSM system

Functional requirement :

Initial value : 00H

Error Identifier : -

Physical range: 0 … 7 = 00H … 07H

Conversion:

Value	Function
00H	Inactive
01H	Mode 1 (sensor value overlay mode)
02H	Mode 2 (output torque overlay mode)
03H	Mode 3 (Particular control)
04H~07H	Free

Receiver of signal and signal features required by the receiver :

MDPS

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Esc_Def	**Information regarding the VSM "defective" Indication**	**VSM1**	**0164H**	**16**	**1**

Signal definition:

Information regarding the VSM "defective" Indication

Functional requirement :

Initial value : 0H

Error Identifier : -

Physical range: 0 … 1 = 00H … 01H

Conversion:

Value	Function
00H	VSM is not defective
01H	VSM is defective

Receiver of signal and signal features required by the receiver :

MDPS

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Esc_AliveCnt	**ESC alive counter**	**VSM1**	**0164H**	**48**	**4**

Signal definition:

ESC Alive Counter

Functional requirement :

Initial value : 0H

Error Identifier : -

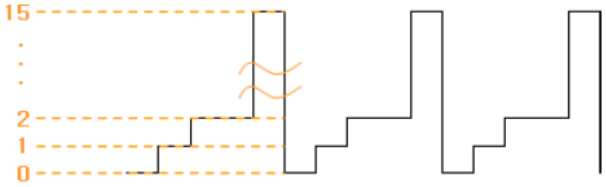
Physical range : 0 … 15 = 0H … FH

Receiver of signal and signal features required by the receiver :

MDPS

Note:

Normal Condition is as follows



%%

LABEL	Designation	Message	Identifier	Bit add.	Bit lnd.
CF_Esc_Chksum	**Checksum**	**VSM1**	**0164H**	**56**	**8**

Signal definition:

ESC Checksum

Functional requirement :

Initial value : -

Error Identifier : -

Physical range : (PH) = [Tx_Byte0] XOR [Tx_Byte1] XOR [Tx_Byte2] XOR [Tx_Byte3] XOR [Tx_Byte4] XOR [Tx_Byte5] XOR [Tx_Byte6]

Receiver of signal and signal features required by the receiver :

MDPS

Note:

6.2.62 VSM2 Message

Message: VSM2	Identifier: 0165h

%%

Signal Label	Signal designation	Bit add.	Bit ind.	Init value	Error ident.
CR_Mdps_StrTq	Steering torque sensor value	0	12	800H	FFFH
CR_Mdps_OutTq	MDPS column torque	12	12	800H	FFFH
CF_Mdps_Def	Information indicating MDPS status	24	1	00H	-
CF_Mdps_SErr	Information indicating VSM1 signal status	25	1	00H	-
Free	Free	17	31	00H	-
CF_Mdps_AliveCnt	MDPS alive counter	48	4	00H	-
Free	Free	52	4	00H	-
CF_Mdps_Chksum	Checksum	56	8	-	-

Memory layout:

CF_Mdps_Chksum			56
Free	CF_Mdps_AliveCnt		48
Free			40
Free			32
Free	CF_Mdps_SErr	CF_Mdps_Def	24
CR_Mdps_OutTq (MSB)			16
CR_Mdps_OutTq (LSB)	CR_Mdps_StrTq (MSB)		8
CR_Mdps_StrTq (LSB)			0

Transmission parameters - Conditions

System	MDPS
Output period	10 ms, Asynchronous mode 10 ms, Synchronous mode
Output period tolerance	± 3ms
Latency	Max. 5ms
Transmit Condition	Power supply via EMS primary relay
Remote operation	no
Message Time out	500ms
Message Validity	IGN1
Phase relationship to another message	no

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_Mdps_StrTq	**Steering torque sensor value**	**VSM2**	**0165H**	**0**	**12**

Signal definition:

Steering torque sensor value

Functional requirement :

Initial value : 800H

Error Identifier : FFFH

Physical range : -20.48 ~ 20.46 Nm = 000H … FFEH

Conversion : (PH) = ((Hex)-800H) * 0.01 [Nm]

Receiver of signal and signal features required by the receiver :

ESC

Note:

PH > 0 : Left Direction (CCW)
PH < 0 : Right Direction (CW)

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CR_Mdps_OutTq	**MDPS column torque**	**VSM2**	**0165H**	**12**	**12**

Signal definition:

MDPS column torque

Functional requirement :

Initial value : 800H

Error Identifier : FFFH

Physical range : -204.8 ~ 204.6 Nm = 000H … FFEH

Conversion : (PH) = ((Hex)-800H) * 0.1 [Nm]

Receiver of signal and signal features required by the receiver :

ESC

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Mdps_Def	**Information indicating MDPS status**	**VSM2**	**0165H**	**24**	**1**

Signal definition:

Information regarding the MDPS “defective” Indication

Functional requirement :

Initial value : 00H

Error Identifier : -

Physical range: 0 … 1 = 00H … 01H

Conversion:

Value	Function
00H	MDPS is not defective
01H	MDPS is defective

Receiver of signal and signal features required by the receiver :

ESC

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Mdps_SErr	**Information indicating VSM1 signal status**	**VSM2**	**0165H**	**25**	**1**

Signal definition:

Information indicating VSM1 signal status

Functional requirement :

Initial value : 0H

Error Identifier : -

Physical range: 0 … 1 = 00H … 01H

Conversion:

Value	Function
00H	VSM1 signal is not error
01H	VSM1 signal is error

Receiver of signal and signal features required by the receiver :

ESC

Note:

%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Mdps_AliveCnt	**MDPS alive counter**	**VSM2**	**0165H**	**48**	**4**

Signal definition:

Information for the ECU to know if messages are lost between the receptions of two messages.

Functional requirement :

Initial value : 0H

Error Identifier : -

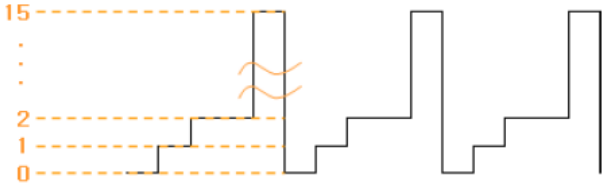
Physical range : 0 … 15 = 0H … FH

Receiver of signal and signal features required by the receiver :

ESC

Note:

Normal Condition is as follows



%%

LABEL	Designation	Message	Identifier	Bit add.	Bit Ind.
CF_Mdps_Chksum	**Checksum**	**VSM2**	**0165H**	**56**	**8**

Signal definition:

Checksum of all bytes of the CAN matrix.

Functional requirement :

Initial value : -

Error Identifier : -

Physical range : (PH) = [Tx_Byte0] XOR [Tx_Byte1] XOR [Tx_Byte2] XOR [Tx_Byte3] XOR [Tx_Byte4] XOR [Tx_Byte5] XOR [Tx_Byte6]

Receiver of signal and signal features required by the receiver :

ESC

Note: