

6 COMMUNICATION PROTOCOLS

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6.1 OVERVIEW

Key components of the DDEC IV system are the serial communication links SAE J1587, SAE J1922, and SAE J1939. Using these communication links allows DDEC IV to offer the following functionality:

- Transmitting sensor information from the ECM via the data link at regular intervals and/or upon request to obtain data and to monitor for failures
- Sharing information between stand-alone modules used in the system via the data link
- Sharing engine data with electronic dashboard displays and vehicle management information systems via the data link
- Transmitting and performing diagnostic procedures from external instrumentation such as the hand-held diagnostic data readers or DDDL via the data link
- Transmitting customer requested changes to the ECM from external instrumentation via the data link
- Transmitting to the powertrain the messages assigned to both the engine and the transmission retarder.

The following industry standard Society of Automotive Engineers (SAE) documents can be used as a reference:

- SAE J1587, *Electronic Data Interchange Between Microcomputer Systems In Heavy Duty Vehicle Applications*
- SAE J1708, *Serial Data Communications Between Microcomputer Systems In Heavy Duty Vehicle Applications*
- SAE J1922, *Powertrain Control Interface For Electronic Controls Used In Medium And Heavy Duty Diesel On-highway Vehicle Applications*
- SAE J1939/71, *Vehicle Application Layer*
- SAE J1939, *Top Layer (Overview)*
- SAE J1939/01, *Truck and Bus Applications*
- SAE J1939/11, *Physical Layer*
- SAE J1939/21, *Data Link Layer*
- SAE J1939/73, *Application Layer Diagnostics*

To obtain a copy of the above documents contact the Society of Automotive Engineers (SAE).

SAE International

400 Commonwealth Drive
Warrendale, PA 15096
Attention: Publications
Phone: (412) 776-4970
www.sae.org

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6.2 SAE J1587

SAE RP J1587 defines the recommended format of messages and data being communicated between microprocessors used in heavy-duty vehicle applications. Circuits 900 (Data Link +) and 901 (Data Link -) as shown on the Vehicle Interface Harness schematic are used as the J1587 communication link. These circuits also exist in the DDEC six-pin diagnostic connector for use with the DDR.

NOTE:

The maximum length for the SAE J1587 Data Link is 40 m (130 ft).

6.2.1 MESSAGE FORMAT

A complete description of the DDEC IV parameters is provided within this section of the manual. DDEC IV transmits parametric data at SAE J1587 recommended rates in packed message form. The first byte or character of each message is the Message Identification character (MID). The MID identifies which microcomputer on the serial communication link originated the information. Each device in the system originating messages must have a unique MID. The assignment of MIDs should be based on those listed in SAE RP J1587. The primary MID for DDEC IV is 128. Engines with 12 and 16 cylinders use MID 128 and MID 175. Engines with 20 cylinders use MID 128, MID 175 and MID 183.

The ProDriver display uses MID 171. Off-board diagnostic tools like hand-held readers should be identified by MID 172. Off-board programming stations like Vehicle Engine Programming Station (VEPS) should be identified by MID 182. Messages using MIDs as recommended by SAE RP J1587 will be responded to by the ECM.

Subsystems also require identifiers. The subsystem identifier character (SID) is a single byte character used to identify field-repairable or replaceable subsystems for which failures can be detected or isolated. SIDs are used in conjunction with SAE standard diagnostic codes defined in J1587 within PID194.

The identifiers used by DDEC are defined and listed in Table 6-1.

Identifier	Description
Failure Mode Identifier (FMI)	The FMI describes the type of failure detected in the subsystem and identified by the PID or SID.
Message Identification Character (MID)	The MID is the first byte or character of each message that identifies which microcomputer on DDEC 1587 serial communication link originated the information.
Parameter Identification Character (PID)	A PID is a single byte character used in DDEC 1587 messages to identify the data byte(s) that follow. PIDs identify the parameters transmitted.
Subsystem Identification Character (SID)	A SID is a single byte character used to identify field-repairable or replaceable subsystems for which failures can be detected or isolated.

Table 6-1 Identifiers Used by DDEC

6.2.2 1708/1587 MESSAGE PRIORITY

Each message sent by DDEC is assigned a priority on a scale of 1 to 8, in compliance with the message priority assignment specified in SAE RP J1708. The most critical message has a priority of one. The message assignments are listed in Table 6-2. All devices transmitting messages across DDEC's 1708/1587 Data Link must be prioritized and transmitted in this manner.

Priority	Description
1 and 2	Reserved for messages that require immediate access to the bus.
3 and 4	Reserved for messages that require prompt access to the bus in order to prevent severe mechanical damage.
5 and 6	Reserved for messages that directly affect the economical or efficient operation of the vehicle.
7 and 8	All other messages not fitting into the previous priority categories.

Table 6-2 Message Priority Assignments

SAE J1587 Parameters Available with DDEC IV

DDEC IV supports the J1587 parameter identifiers (PIDs) listed in Table 6-3 and listed in Table 6-4.

NOTE:

Data is transmitted only if the source has been configured for the engine.

PID	Description	PID	Description
147	Average Fuel Economy — Natural Gas	248	Total VSG Hours
148	Instantaneous Fuel Economy — Natural Gas	249	Total Engine Revolution
149	Mass Flow Rate — Natural Gas	250	Total Fuel Used
229	Total Fuel Used — Natural Gas	251	Clock
230	Total Idle Fuel Used — Natural Gas	252	Date
231	Trip Fuel — Natural Gas	351	Turbo Compressor Inlet Temperature
243	Device Identification	354	Relative Humidity
244	Trip Miles	404	Turbo Compressor Out Temperature
245	Total Miles	411	EGR Differential Pressure
247	Total Engine Hours	412	EGR Temperature
—	—	439	Extended Range Boost Pressure

Table 6-3 SAE J1587 PIDs Provided by DDEC IV

PID	Description	PID	Description
–	–	109	Coolant Pressure
18	Extended Range Fuel Pressure	110	Coolant Temperature
19	Extended Range Oil Pressure	111	Coolant Level
20	Extended Range Coolant Pressure	113	Engine Governor Droop
44	Attention/Warning Indicator Lamps Status	121	Engine Retarder Status
48	Extended Range Barometric Pressure	122	Engine Retarder Percent
51	Throttle Position	153	High Range Crankcase Pressure
52	Engine Intercooler Temperature	154	Auxiliary Input & Output Status #2
62	Retarder Inhibit Status	155	Auxiliary Input & Output Status #1
65	Service Brake Switch Status	162	Transmission Range Selected
68	Torque Limiting Factor	163	Transmission Range Attained
70	Parking Brake Switch Status	164	Injection Control Pressure
71	Idle Shutdown Timer Status	166	Rated Engine Power
72	Blower Bypass Valve Position/Blower Bypass Door Position	168	Battery Potential (Voltage)
73	Auxiliary Water Pump Pressure	171	Ambient Air Temperature
74	Vehicle Speed Set Limit	172	Air Inlet Temperature
81	Exhaust Back Pressure	173	Exhaust Temperature
83	Vehicle Speed Limit Status	174	Fuel Temperature
84	Vehicle Speed	175	Engine Oil Temperature
85	Cruise Control Switch Status	182	Trip Fuel
86	Cruise Control Set Speed	183	Fuel Rate
87	Cruise Control High Limit	184	Instantaneous Fuel Economy, (mile/gal)
88	Cruise Control Low Limit	185	Average Fuel Economy, (mile/gal)
89	VSG Switch Status	187	PTO Set Speed
91	Percent Throttle	188	Idle Engine Speed
92	Percent Engine Load	189	Rated Engine Speed
93	Output Torque	190	Engine Speed
94	Fuel Delivery Pressure	191	Transmission Output Shaft Speed
95	Fuel Filter Differential Pressure	192	Multi-sectioned Parameter
98	Engine Oil Level	194	Transmitter System Diagnostic Code and Occurrence Count Table
99	Oil Filter Differential Pressure	196	Diagnostic Data/Count Clear Response
100	Engine Oil Pressure	222	Anti-Theft
101	Crankcase Pressure	228	Speed Sensor Calibration
102	Turbo Boost Pressure	233	Unit Number
103	Turbo Speed	234	Software Identification
105	Intake Manifold Temperature	235	Total Idle Hours
106	Air Inlet Pressure	236	Total Idle Fuel Used
107	Air Filter Differential Pressure	237	Vehicle Identification Number (VIN)
108	Barometric Pressure	240	Last Customer Calibration Change Hours

Table 6-4 SAE J1587 PIDs Provided by DDEC IV (continued)

6.2.3 SAE J1587 PIDS REQUIRING DDEC ACTION

DDEC will respond to data requests per the J1587 PID requests shown in the next sections.

Data Request

The format for a data request is shown below.

PID	Data
0	a a - Parameter number of the requested parameter

Component Specific Request

The format for a component specific request is shown below.

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

NOTE:

DDEC responds with the appropriate data provided the MID in byte (b) matches the MID stored in calibration. The primary MID for DDEC IV is 128. Engines with 12 and 16 cylinders use MID 128 and MID 175. Engines with 20 or 24 cylinders use MID 128, MID 175 and MID 183.

Retarder Status Request

Electronic transmissions may indicate the status of the transmission output retarder to DDEC by using the following message:

PID	Data
47	a a - Transmission output retarder status Bits 2-1 Output retarder status 00 = off 10 = error 01 = on 10 = error Bits 8-3 Reserved, Bits set to 1
comments:	This parameter is supported in Release 4.00 or later.

Transmitter Data Request / Clear Count

The format for a transmitter data request is shown below.

PID	Data
195	n a b c n - Number of parameter data characters = 3 a - MID of the device to which the request is directed b - SID or PID of a standard diagnostic code c - Diagnostic code number
Bits: 1 - 4	Failure mode identifier (FMI) of a standard diagnostic code
Bit: 5	Byte (b) identifier 1 - Byte (b) is a Subsystem Identifier (SID) 0 - Byte (b) is a Parameter Identifier (PID)
Bit: 6	Type of diagnostic code 1 - Standard diagnostic code 0 - Reserved for expansion diagnostic codes
Bit: 7, 8	-- Request an ASCII descriptive message for the given diagnostic code. 01 - Request count be cleared for the given diagnostic code on the device with the given MID. 10 - Request counts be cleared for all diagnostic codes on the device with the given MID. The diagnostic code given in this transmission is ignored. 11 - Request additional diagnostic information for the given diagnostic code, the content of which is defined under PID 196.

NOTE:

DDEC responds with the appropriate data using PID 196.

source: ECM calculated; outputs represent intended state

PID 256 (255 0) Page 2 Data Request

The format for Page 2 data requests is shown below.

PID	Data
0	a a - Parameter number of the requested parameter from Page 2

J1587 Outputs - Single Byte Parameters

PID 18 - Extended Range Fuel Pressure

update rate: 1 time/s
resolution: 4 kPa/Bit (Uns/SI)
source: Fuel Pressure Sensor
comments: This PID is used to provide a wider range of pressure values than that provided with PID 94.
This parameter is available with Release 24.00 software or later.

PID 19 - Extended Range Engine Oil Pressure

update rate: 1 time/s
resolution: 4 kPa/Bit (Uns/SI)
source: Engine Oil Pressure Sensor
sensor range: 0 to 145 psi
comments: This PID is used to provide a wider range of pressure values than that provided with PID 100.
This parameter is available with Release 24.00 software or later.

PID 20 - Extended Range Coolant Pressure

update rate: 1 time/s
resolution: 2 kPa/Bit (Uns/SI)
source: Coolant Pressure Sensor
comments: This PID is used to provide a wider range of pressure values than that provided with PID 109.
This parameter is available with Release 24.00 software or later.

PID 44 - Attention/Warning Indicator Lamps Status

update rate: 10 time/s or
1 time/s when
changing

format:

Bit: 1,2	Stop Engine Light Status
	00 - off
	01 - on
	10 - error
	11 - Not Available
Bit: 3,4	Check Engine Light Status
	00 - off
	01 - on
	10 - error
	11 - Not Available
Bit: 5-8	Reserved, All Bits set to 1

PID 48 - Extended Range Barometric Pressure

update rate: 1 time/s
resolution: 0.6 kPa/Bit (Uns/SI)
source: Barometric Pressure Sensor or Turbo Boost Pressure Sensor

PID 51 - Throttle Position

update rate: 5 time/s
resolution: 0.4%/Bit (Uns/SI)
source: Throttle Position Sensor
comments: This parameter identifies the position of the value used to regulate the supply of a fluid, usually air or fuel/air mixture, to an engine - 0% represents no supply.

PID 52 - Engine Intercooler Temperature

update rate: 1 time/s
resolution: 1°F/Bit (Uns/SI)
source: Engine Intercooler Temperature Sensor

PID 62 - Retarder Inhibit Status

update rate: On request
 format:
 Bits: 1, 2 Retarder Inhibit Status
 00 - Off (not Inhibited)
 01 - On (Inhibited)
 Bits: 3-8 Uncommitted, all Bits set to 1
 source: Digital output for Engine Brake Enable
 comments: Used with the Engine Brake outputs.

PID 65 - Service Brake Status

update rate: 1 time/s
 format:
 Bits: 1, 2 Service Brake Status
 00 - off
 01 - on
 Bits: 3-8 Uncommitted, all Bits set to 1
 Bits 3-8 = 1
 source: Service Brake Switch

PID 68 - Torque Limiting Factor

update rate: 1 time/s
 resolution: 0.5%/Bit (Uns/SI)
 source: ECM calculated.
 comments: This parameter indicates the amount of engine protection torque reduction that is in effect.

PID 70 - Parking Brake Switch Status

update rate: 1 time/s
 format:
 Bits: 8 Parking Brake Switch Status
 0 - off
 1 - on
 Bits: 1-7 Uncommitted, all Bits set to 0
 source: Parking Brake Switch

PID 71 - Idle Shutdown Timer Status

update rate: 1 time/s
format:

Bit: 1	Idle Shutdown Override ("Driver Alert") 1 - Active
Bit: 2	Engine Has Shutdown by Idle Timer to 1 - Yes
Bit: 3	Idle Timer Shutdown Override 1 - Active (Idle Shutdown has been overridden)
Bit: 4	Idle shutdown timer function 1 - Enabled in calibration 0 - Disabled in calibration
Bit: 8	Idle Shutdown Timer Status 1 - Active
Bits: 5-7	All Bits set to 0

source: ECM calculated

PID 72 - Blower Bypass Valve Position

update rate: 2 times/s
resolution: 0.4%/Bit (Uns/SI)
source: Blower Bypass Valve Position sensor
comments: Electronically controlled blower bypass valves are used on Methanol engines.

PID 73 - Auxiliary Water Pump Pressure

update rate: 1 time/s
resolution: 2 psi/Bit (Uns/SI)
source: Water Pump Pressure Sensor
comments: The auxiliary Water Pump Pressure system is used on fire trucks with DDEC pressure control. The transmitted value is gage pressure.

PID 74 - Vehicle Speed Set Limit (Road Speed Limiting)

update rate: On request only
resolution: 0.5 mph/Bit (Uns/SI)
source: Calibration value (customer defined)
comments: Vehicle Speed Limiting is a customer option.

PID 81 — Exhaust Back Pressure

update rate: 1 time/sec.
resolution: 0.169 kPa/Bit (Uns/SI)
comments: Update rate is different than that specified by SAE (every 10 sec.)

PID 83 - Vehicle Speed Limit Status

update rate: 1 time/s

format:

Bit: 8	Vehicle Speed Status
	1 - Active
Bits: 1-7	All Bits set to 0

source: ECM calculated

comments: Vehicle Speed Limiting is a customer option.

PID 84 - Vehicle Speed

update rate: 10 times/s

resolution: 0.5 mph/Bit (Uns/SI)

source: Vehicle Speed Sensor input

comments: Transmitted only if the Vehicle Speed Sensor is configured.

PID 85 - Cruise Control Switch Status

update rate: 10 times/s

format:

	On/Off Switch
Bit: 1	1-On 0-Off
	Set Switch
Bit: 2	1-Off 0-On
	Coast Switch
Bit: 3	1-Off 0-On
	Resume Switch
Bit: 4	1-Off 0-On
	Accel Switch
Bit: 5	1-Off 0-On
	Brake Switch
Bit: 6	1-Off 0-On
	Clutch Switch
Bit: 7	1-Off 0-On
	Cruise Active
Bit: 8	1-On 0-Off

source: Cruise Control switch inputs

comments: Cruise Control status (Bit 8) is not cleared if Cruise Control is active but being overridden by the throttle.

PID 86 - Cruise Control Set Speed

update rate: 0.1 times/s, 5 times/s when the set speed is changing

resolution: 0.5 mph/Bit (Uns/SI)

source: Cruise Control switch inputs

comments: Transmitted if Vehicle Speed Cruise control is enabled.

PID 87 - Cruise Control High Set Limit

update rate: On request only

resolution: 0.5 mph/Bit (Uns/SI)

source: Calibration value (customer define)

comments: Transmitted if Vehicle Speed Cruise control is enabled.

PID 88 - Cruise Control Low Set Limit

update rate: On request only
 resolution: 0.5 mph/Bit (Uns/SI)
 source: Calibration value
 comments: Transmitted if Vehicle Speed Cruise control is enabled.

PID 89 - VSG Switch Status

update rate: 1 time/s
 format:

Bit: 1	On/off switch 0-Off 1-On
Bit: 2	Set switch 0-Off 1-On
Bit: 3	Coast switch 0-Off 1-On
Bit: 4	Resume switch 0-Off 1-On
Bit: 5	Accel switch 0-Off 1-On
Bit: 6	Brake 0-Off 1-On
Bit: 7	Clutch 0-Off 1-On
Bit: 8	VSG 0-Off 1-On

source: VSG switch inputs/ECM calculated
 comments: Transmitted when either the Pressure Sensor Governor, Cruise-Switch VSG or analog VSG is configured.

PID 91 - Percent Throttle

update rate: 10 times/s
 resolution: 0.4%/Bit (Uns/SI)
 source: Throttle Sensor input

PID 92 - Percent Engine Load

update rate: 10 times/s
resolution: 0.5%/Bit (Uns/SI)
source: ECM calculated
comments: Percent engine load is the ratio of actual torque and the minimum of the requested torque and digital torque limit.

PID 93 - Output Torque

update rate: 1 time/s
resolution: 20 ft-lb/Bit (S/SI)
source: ECM calculated

PID 94 - Fuel Delivery Pressure

update rate: 1 time/s
resolution: 0.5 psi/Bit (Uns/SI)
source: Fuel Pressure Sensor

PID 95 - Fuel Filter Differential Pressure

update rate: 0.1 time/s
resolution: 0.25 psi/Bit (Uns/SI)
source: Fuel Filter Differential Pressure Sensor
comments: This parameter is available with Release 24.00 software or later.

PID 98 - Engine Oil Level

update rate: 0.1 time/s
resolution: 0.5%/Bit (Uns/SI)
source: Oil Level Sensor

PID 99 - Oil Filter Differential Pressure

update rate: 0.1 time/s
resolution: 0.0625 psi/Bit (Uns/SI)
source: Oil Filter Differential Pressure Sensor
comments: This parameter is available with Release 24.00 software or later.

PID 100 - Engine Oil Pressure

update rate: 1 time/s
resolution: 0.5 psi/Bit (Uns/SI)
source: Oil pressure sensor
sensor range: 0 to 65 psi

PID 101 - Crankcase Pressure

update rate: 1 time/s
resolution: 0.125 psi/Bit (S/SI)
source: Crankcase pressure sensor
comments: Some engine applications use a discrete switch in place of a full range sensor. In these applications, the crankcase pressure data transmitted on the J1587 data link is not a true representation of crankcase pressure.

PID 102 - Turbo Boost Pressure (Gage)

update rate: 2 times/s
resolution: 0.125 psi/Bit (Uns/SI)
source: Turbo Boost Pressure Sensor
comments: Update rate is different than that specified by SAE (1 time/sec)

PID 103 - Turbo Speed

update rate: 1 time/s
resolution: 500 rpm/Bit (Uns/SI)
source: Turbo Speed Sensor

PID 105 - Intake Manifold Temperature

update rate: 1 time/s
resolution: 1°F/Bit (Uns/SI)
source: Intake Manifold Temperature Sensor

PID 106 - Air Inlet Pressure

update rate: 1 time/s
resolution: 0.25 psi/Bit (Uns/SI)
source: Air Inlet Pressure Sensor or Boost Pressure Sensor (Series 2000 and Series 4000 only before Release 21.0, Series 50 and Series 60 beginning with Release 21.0)

PID 107 - Air Filter Differential Pressure

update rate: 0.1 time/s
resolution: 0.2 in.H₂O/Bit (Uns/SI)
source: Air Filter Differential Pressure Sensor
comments: This parameter is available with Release 24.00 software or later.

PID 108 - Barometric Pressure

update rate: 1 time/s
resolution: 0.0625 psi/Bit (Uns/SI)
source: Barometric Pressure Sensor or ECM calculated

PID 109 - Coolant Pressure

update rate: 1 time/s
 resolution: 0.125 psi/Bit (Uns/SI)
 source: Coolant Pressure Sensor

PID 110 - Coolant Temperature

update rate: 1 time/s
 resolution: 1°F/Bit (Uns/SI)
 source: Coolant Temperature Sensor
 sensor range: 0 to 300 F

PID 111 - Coolant Level

update rate: 10 times/s
 resolution: 0.5%/Bit (Uns/SI) (or full = 100%, low = 0%)
 source: Coolant Level Sensor
 comments: If the Add Coolant Level Sensor (ACLS) is installed with the Engine Protection Coolant Level Sensor (CLS), the coolant level will be:

100%	When both sensors are in coolant
50%	When the ACLS is out of the coolant
0%	When both sensors are out of the coolant

If only the CLS is configured:

100%	Full
0%	Low

PID 113 - Engine Governor Droop

update rate: On request only
 resolution: 2 rpm/Bit (Uns/SI)
 source: Calibration value

PID 121 - Engine Retarder Status

update rate: 1 time/s (5 times/s when changing)
 format:

Bit: 1	1 - 2 cylinders active
Bit: 2	1 - 3 cylinders active
Bit: 3	1 - 4 cylinders active
Bit: 4	1 - 6 cylinders active
Bit: 5	1 - 8 cylinders active
Bit: 8	1 - Retarder active

comments: Transmitted only if engine brakes are configured.

PID 122 - Engine Retarder Percent

update rate: 1 time/s
resolution: 0.5%Bit (Uns/SI)
source: ECM calculated
comments: This parameter is available with Release 5.00 or later

PID 351 (255 95) - Turbo Compressor Inlet Temperature

update rate: 1 time/s
resolution: 1°F/Bit (Uns/SI)
comments: This parameter is available with Rel 33.0 software or later.

PID 354 (255 98) - Relative Humidity

update rate: Every 10 seconds
resolution: 0.4%Bit (Uns/SI)
comments: This parameter is available with Rel 33.0 software or later.

Double Byte Parameters**PID 147** - Average Fuel Economy — Natural Gas

update rate: every 10 seconds
resolution: 1/512 km/kg per bit (Uns/I)

PID 148 - Instantaneous Fuel Economy — Natural Gas

update rate: 5 times/s
resolution: 1/512 km/kg per bit (Uns/I)

PID 149 - Fuel Mass Flow Rate — Natural Gas

update rate: 5 times/s
resolution: 0.125 kg/hr per bit (Uns/I)

PID 153 - Crankcase Pressure

update rate: 1 time/s
resolution: 0.0078125 kPa/Bit (S/I)
comments: Some engine applications use a discrete switch in place of a full range sensor. In these applications, the crankcase pressure data transmitted on the J1587 data link is not a true representation of crankcase pressure. This PID is used to provide crankcase pressure with better resolution than that provided with PID 101. This parameter is available with Release 3.00 software or later.

PID 154 - Auxiliary Input and Output status #2

update rate: On request

format:

PID	Data
154	a b

- a - Auxiliary Input Status
 - Bit: 1, 2 Torque/RPM Limiting Switch
 - 00 - Off
 - 01 - On
 - 10 - Error Condition
 - 11 - Not Available
 - Bit: 4-3 Stop Engine Override Switch
 - 00 - Off
 - 01 - On
 - 10 - Error Condition
 - 11 - Not Available
 - Bit: 5, 6 A/C Disengaged
 - 00 - Off
 - 01 - On
 - 10 - Error Condition
 - 11 - Not Available
 - Bit: 8-7 Reserved
- b - Auxiliary Output Status
 - Bit: 1, 2 Fan Control #2
 - 00 - Off
 - 01 - On
 - 10 - Error Condition
 - 11 - Not Available
 - Bit: 3, 4 Reserved
 - Bit: 5, 6 Reserved
 - Bit: 7, 8 Reserved

source: ECM calculated; outputs represent intended state

PID 155 - Auxiliary Input and Output status #1

update rate: On request

format:

PID	Data
154	a b

- a - Auxiliary Input Status
 - Bit:1, 2 Jake Brake Low Switch
 - 00 - Off
 - 01 - On

- 10 - Error Condition
 - 11 - Not Available
 - Bit: 3, 4 Jake Brake Medium Switch
 - 00 - Off
 - 01 - On
 - 10 - Error Condition
 - 11 - Not Available
 - Bit: 5, 6 Idle Validation Switch
 - 00 - Off
 - 01 - On
 - 10 - Error Condition
 - 11 - Not Available
 - Bit: 7, 8 Throttle Inhibit Switch
 - 00 - Off
 - 01 - On
 - 10 - Error Condition
 - 11 - Not Available
 - b - Auxiliary Output Status
 - Bit: 1, 2 Vehicle Power Shutdown
 - 00 - Off
 - 01 - On
 - 10 - Error Condition
 - 11 - Not Available
 - Bit: 3, 4 Starter Lockout
 - 00 - Off
 - 01 - On
 - 10 - Error Condition
 - 11 - Not Available
 - Bit: 5, 6 Coolant Level Low Light
 - 00 - Off
 - 01 - On
 - 10 - Error Condition
 - 11 - Not Available
 - Bit: 7, 8 Fan Control #1
 - 00 - Off
 - 01 - On
 - 10 - Error Condition
 - 11 - Not Available
- source: ECM calculated; outputs represent intended state

PID 162 - Transmission Range Selected

update rate: 2 times/s
format: aa - Transmission Range Selected (ASCII)
comments: Transmitted only when the transmission type is a Meritor ESS (17-22).
Characters sent will be 0, L, 1, 2, ..., 15. If only one character is required,
the second character will be used and the first character will be a space.
Whenever a target gear is not selected a "0" will be transmitted.

PID 163 - Transmission Range Attained

update rate: 2 times/s
format: aa - Transmission Range Attained (ASCII)
comments: Transmitted only when the transmission type is a Meritor ESS (17-22).
Characters sent will be 0, L, 1, 2, ..., 15. If only one character is required,
the second character will be used and the first character will be a space.
Whenever a target gear is not selected a "0" will be transmitted.

PID 164 - Injection Control Pressure

update rate: 1 time/s
resolution: 1/256 MPa (Uns/I)
source: Injection Pressure Sensor

PID 166 - Engine Horsepower Rating

update rate: On request only
resolution: 1 bhp/Bit (Uns/I)
source: Calibration value

PID 168 - Battery Voltage

update rate: 1 time/s
resolution: 0.05 volts/Bit (Uns/I)
source: Battery voltage measured at input to ECM
comments: The ECM input battery voltage does fluctuate as injectors fire and will require
filtering if used for display purposes.

PID 171 - Ambient Air Temperature

update rate: 1 time/s
resolution: 0.25°F/Bit (S/I)
source: ECM estimated

PID 172 - Air Inlet Temperature

update rate: 1 time/s
 resolution: 0.25°F/Bit (S/I)
 source: Air Temperature Sensor
 sensor range: -40 to 175°F

PID 173 — Exhaust Temperature

update rate: 1 time/sec
 resolution: 0.25°F/Bit (S/I)

PID 174 - Fuel Temperature

update rate: 1 time/s
 resolution: 0.25°F/Bit (S/I)
 source: Fuel Temperature Sensor
 sensor range: -40 to 175°F

PID 175 - Engine Oil Temperature

update rate: 1 time/s
 resolution: 0.25°F/Bit (S/I)
 source: Oil temperature sensor
 sensor range: -40 to 300°F

PID 182 - Trip Fuel

update rate: 0.1 times/s
 resolution: 0.125 gal/Bit (Uns/I)
 source: ECM calculated

PID 183 - Fuel Rate

update rate: 5 times/s
 resolution: 1/64 gal/hour/Bit (Uns/I)
 source: ECM calculated

PID 184 - Instantaneous Fuel Economy (MPG)

update rate: 5 times/s
 resolution: 1/256 mpg/Bit (Uns/I)
 source: ECM calculated
 comments: Transmitted only if the Vehicle Speed Sensor is configured.

PID 185 - Average Fuel Economy (MPG)

update rate: 0.1 times/s
resolution: 1/256 mpg/Bit (Uns/I)
source: ECM calculated
comments: Trip information from DDEC requires that the Vehicle Speed Sensor is enabled.

PID 187 - VSG Set Speed

update rate: 0.1 times/s, 5 times per s when the set speed is changing
resolution: 0.25 rpm/Bit (Uns/I)
source: VSG switch input
comments: Used to indicate the current set speed from:
 Analog VSG
 Cruise Switch VSG
 Engine Speed Cruise Control
 Pressure Governor Mode - RPM or pressure
 Engine Sync. Mode (marine applications)

PID 188 - Idle Set Speed

update rate: On request only
resolution: 0.25 rpm/Bit (Uns/I)
source: Calibration value

PID 189 - Rated Engine Speed

update rate: On request only
resolution: 0.25 rpm/Bit (Uns/I)
source: Calibration value

PID 190 - Engine Speed

update rate: 10 times/s
resolution: 0.25 rpm/Bit (Uns/I)
source: ECM calculated

PID 191 - Transmission Output Shaft Speed

update rate: 10 times/s
resolution: 0.25 rpm/Bit (Uns/I)
source: Transmitted when configured for Meritor ESS transmissions only.

PID 404 (255 148) - Turbo Compressor Out Temperature

update rate: 1 times/s
resolution: 0.25°F/Bit (S/I)

PID 411 (255 155) - EGR Delta Pressure

update rate: 1 time/s
resolution: 0.0078125 kPa/Bit (S/I)
comments: This parameter is available with Rel 33.0 software or later.

PID 412 (255 156) - EGR Temperature

update rate: 1 time/s
resolution: 0.25°F/Bit (S/I)
comments: This parameter is available with Rel 33.0 software or later.

PID 439 (255 183) - Extended Range Boost Pressure

update rate: 1 time/s
resolution: 0.125 kPa/Bit (UnS/I)
comments: This parameter is available with Rel 36.0 software or later.

Variable Length Parameters

PID 192 - Multi-Section Parameter

update rate: Used to transmit messages that are greater than 21 bytes in length.

format:

PID	Data
192	n a b c/d c c c c c Byte count of data that follows this character. This excludes characters MID, PID 192 and n but it includes a, b, c, or d type character. a - PID specifying the parameter that has been sectioned. The last section number (total number of sections minus ONE) and the current section number. The upper nibble contains the current section number (1 to 15). The lower nibble contains the current section number and is limited to the range 0 to 15. Section numbers are assigned in ascending order. b - Data portion of the sectioned parameter. May be 1 to 14 characters in the first packet. May be 1 to 15 characters in the middle and ending packets. c - characters in the first packet. May be 1 to 15 characters in the middle and ending packets. d - Byte count of the total data portion. This character is sent only in the first packet. The values are limited to 239 or less but must be greater than 17.

comment: PID 192 is used to section any DDEC message that exceeds 21 bytes while the engine is running, in particular PID 194, PID 196, and PID 243. If the engine is stopped, DDEC may transmit messages up to 40 bytes in length.

PID 194 - Transmitter System Diagnostic Code / Occurrence Count Table

update rate: On Request only

format:

PID Data

194 n a b c a b c a b c a b c...

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

a - SID or PID of a standard diagnostic code.

b - Diagnostic code character

Bits: 1-4 FMI of a standard diagnostic code

Bit: 5 Byte (a) Identifier

1 - Byte (a) is a SID

0 - Byte (a) is a PID

Bit: 6 Type of Diagnostic Code

1 - standard diagnostic code

0 - expansion diagnostic codes (PID/SID from page 2)

Bit: 7 Current Status of Fault

1 - fault is inactive

0 - fault is active

Bit: 8 Occurrence count

1 - count is included

0 - count is not included

c - Occurrence count for the diagnostic code defined by the preceding 2 characters. The maximum occurrence count is 255. Bit 8 of byte (b) of the diagnostic code is used to determine if it is included.

source: ECM calculated

comment: Diagnostic codes are transmitted periodically while active. When the active code becomes inactive, the code is transmitted once to indicate that the fault became inactive. Inactive diagnostic codes are available by request of PID 194. If more than 6 codes are active at any point, PID 194 is sectioned as described in PID 192.

PID 196 - Diagnostic Data/count clear response

update rate: On Request only

format:

PID	Data
196	n a b c c c c c

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

a - SID or PID of a standard diagnostic code

b - Diagnostic Code Character

Bits 1-4 - FMI of a standard diagnostic code

Bit 5 - Byte (a) identifier

1 - Byte (a) is a SID

0 - Byte (a) is a PID

Bit 6 - Type of diagnostic code

1 - standard diagnostic code

0 - expansion diagnostic codes (PID/SID from page 2)

Bit 7-8 - Action

- Message is an ASCII descriptive message for the given diagnostic code.

01 - The count has been cleared for the given diagnostic code.

10 - All clearable diagnostic counts have been cleared for this device.

- Message is additional diagnostic information for the given diagnostic code, as defined below.

c = Additional information (if applicable)

c1-c5 - ATA/VMRS (DTDSC)

c6, c7 - Engine hours the code was first logged (LSB first)

format: 1 h/Bit.

range - 0-65535 hours.

c8, c9 - Calendar date (Month, Day) the code was first logged, if available.

c10, c11 - Clock time the code was first logged (hours, minutes), if available.

c12, c13 - Engine hours the code last became active (LSB first).

c14, c15 - Calendar date (Month, Day) the code last became active, if available.

c16, c17 - Clock time the code last became active (hours, minutes), if available.

PID 196 - Diagnostic Data/count clear response

update rate: On Request only

format:

PID	Data
-----	------

- c18, c19 - Number of ss the code has been active (LSB first).
 format: ss = 1 s/Bit
 range = 0-65535 (18.2 hours)
 Value remains at 65535 ss once it has been reached.
- c20 - Number of Stop Engine Override Switch restarts while the code was active. The value remains at 255 once it has been reached.
- c21+ = Optional associated parameter value (scaled as defined in J1587)
 For temperatures, pressures, and voltages with FMI 0 - Highest value achieved
 For temperatures, pressures, and voltages with FMI 1 - Lowest value achieved
 For engine speed with FMI 0 - Highest speed achieved
 For vehicle speed with FMI 0 or 11 - Highest speed achieved

Last byte = checksum

source: ECM calculated

comment: The date and time that the code last became inactive (bytes c14-c17) will be transmitted as zero if the code is currently active. This data may be sectioned using PID 192.

PID 228- Speed Sensor Calibration

update rate: On Request only

format:

PID	Data
-----	------

228	n a a a a
-----	-----------

n = number of bytes: 4

a = Speed Sensor Calibration 1 pulse/mi (Uns/LI)

source: Calculated from calibration values

PID 229- Total Fuel — Natural Gas

update rate: On Request

format:

PID Data

229 n a a a a

n = number of bytes: 4

a = total fuel used

resolution: 0.5 kg per bit (Uns/LI)

PID 230- Total Idle Fuel Used — Natural Gas

update rate: On Request

format:

PID Data

230 n a a a a

n = number of bytes: 4

a = total fuel used

resolution: 0.5 kg per bit (Uns/LI)

PID 231- Trip Fuel — Natural Gas

update rate: Every 10 seconds

format:

PID Data

231 n a a a a

n = number of bytes: 4

a = trip fuel

resolution: 0.5 kg per bit (Uns/LI)

PID 233- Unit Number (Power Unit)

update rate: On Request only

format:

PID Data

231 n a a a . . .

n = number of bytes: 10

a = unit number in alphanumeric ASCII characters

comment: This parameter is available with Release 20.00 software or later

PID 234- Software Identification

update rate: On Request only

format:

PID Data

234 n a a b c c

n = number of bytes: 5

a = Major software release level in ASCII

b = ASCII "."

c = Minor software release level in ASCII

Example: "01.05" is interpreted as Major release 1, Minor release 5

source: ECM calculated

comment: This parameter is available with Release 3.00 software or later

PID 235- Total Idle Hours

update rate: On Request only

format:

PID Data

235 n a a a a

n = number of bytes: 4

a = Total idle hours; scaled 0.05 hours/Bit (Uns/LI)

source: ECM calculated

comment: Accumulates time while the engine is operating at idle.

PID 236- Total Idle Fuel Used

update rate: On Request only

format:

PID Data

236 n a a a a

n = number of bytes: 4

a = Idle fuel used; scaled 1/8 gallons/Bit (Uns/LI)

source: ECM calculated

comment: Accumulates while the engine is operating at idle.

PID 237- Vehicle Identification Number (VIN)

update rate: On Request only

format:

PID Data

237 n a a a ...

n = number of bytes: up to 17

a = VIN in ASCII characters

source: Calibration value

PID 240- Last Customer Calibration Change Hours

update rate: On Request only

format:

PID Data

240 n a a a a

n = number of bytes: 4

a = Last customer calibration change hours; scaled 0.05 h/Bit (Uns/LI)

source: ECM calculated

comment: Used to identify the last customer reprogramming occurrence, stored in engine hours.

PID 243- Device Identification

update rate: On Request only

format:

PID Data

243 n a b b b b c d d d d d d e f f f f f f f f f f

n = number of bytes: 26

a = component ID = MID

b = ATA/VMRS manufacturer ID (5 bytes)

c = delimiter: ASCII '*'

d = engine model number (8 bytes)

e = delimiter: ASCII '*'

f = engine serial number (10 bytes)

source: Calibration value

comment: This parameter may be sectioned using PID 192.

PID 244- Trip Miles

update rate: 0.1 times/s

format:

PID Data

244 n a a a a

n = number of bytes: 4

a = trip miles 0.1 mile/Bit (Uns/LI)

source: ECM calculated

comment: Transmitted only if the vehicle speed sensor is configured.

PID 245- Total Miles

update rate: 0.1 times/s

format:

PID Data

245 n a a a a

n = number of bytes: 4

a = total miles, 0.1 mile/Bit (Uns/LI)

source: ECM calculated

comment: Transmitted only if the vehicle speed sensor is configured.

PID 247- Total Engine Hours

update rate: On request only

format:

PID Data

247 n a a a a

n = number of bytes: 4

a = total engine hours 0.05 hour/Bit (Uns/LI)

source: ECM calculated

comment: Used to identify the total hours that the engine is operating. Time accumulated while the engine speed is above 60 rpm.

PID 248- Total VSG Hours

update rate: On request only

format:

PID Data

248 n a a a a

n = number of bytes: 4

b = total VSG hours 0.05 hour/Bit (Uns/LI)

source: ECM calculated

comment: Used to identify total engine hours the engine is operating in the following modes:

-Hand throttle VSG

-High idle using cruise switches

-Pressure governor mode: either RPM or pressure

PID 249- Total Engine Revolutions

update rate: On request only

format:

PID Data

249 n a a a a

n = number of bytes: 4

a = total engine revolutions 1000 revolutions/Bit (Uns/SI)

comment: This parameter is available with Release 20.00 software or later

PID 250- Total Fuel Used

update rate: On request only

format:

PID Data

250 n a a a a

n = number of bytes: 4

a = total fuel used 0.125 gal/Bit (Uns/LI)

source: ECM calculated

PID 251- Clock

update rate: On request only

format:

PID	Data
251	n a b c

n = number of bytes: 3

a = Seconds 0.25 sec/Bit, range 0 to 59.75 seconds

b = Minutes 1.0 min/Bit, range 0 to 59 minutes

c = Hours 1.00 hour/Bit, range 0 to 23 hours

comment: Transmitted if clock data is considered valid. The time is broadcast in Greenwich Mean Time. This parameter is available with Release 20.00 software or later.

PID 252- Date

update rate: On request only

format:

PID	Data
252	n a b c

n = number of bytes: 3

a = Day 0.25 day/Bit, range 1 to 31.75 days

b = Month 1.0 month/Bit, range 1 to 12 months

c = Year - 1985 1.00 year/Bit, range 0 to 99

comment: Day of the month is scaled such that 0 is a null value, values 1, 2, 3, and 4 are the first day of the month, 5, 6, 7, 8, are the second day of the month, etc. Transmitted if clock data is considered valid. This parameter is available with Release 20.00 software or later.

6.3 SAE J1922

Circuits 800 (Data Link +) and 801 (Data Link-) as shown on the communications harness schematic are used as the J1922 communication link.

6.3.1 MESSAGE FORMAT

A complete description of the DDEC IV parameters is provided within this section of the manual. DDEC IV transmits parametric data at SAE J1922 recommended rates in packed message form. The first byte or character of each J1922 message is the Message Identification Character (MID). The MID is used to identify the source of a data transmission and identify the type of data being transmitted.

6.3.2 SAE J1922 PARAMETERS AVAILABLE WITH DDEC IV

DDEC IV supports the J1922 message identifiers (MIDs) listed in Table 6-5.

MID	Description
69	Engine to powertrain message
70	Engine to powertrain initialization message
74	Transmission to powertrain message
76	Transmission to powertrain initialization request message
79	ABS/traction control to powertrain message
81	ABS/traction control to powertrain initialization request message
83	Retarder to powertrain message
84	Retarder to powertrain initialization message

Table 6-5 SAE J1922 MIDs Supported by DDEC

6.3.3 SAE J1922 MIDS

The following sections identify the MIDs supported by DDEC.

Engine to Powertrain

Byte 1	069	MID - Engine to powertrain
Byte 2	---	Percent torque value scaled 1% of peak torque/Bit - S/SI
Byte 3	---	Accelerator pedal position scaled 0.392%/Bit (100/255%/Bit) - Uns/SI
Byte 4	---	Control/status byte
Bit 1		Cruise control status 1: cruise control active 0: cruise control inactive
Bit 2		VSG control status 1: VSG active 0: VSG inactive
Bit 3		Road speed limit status 1: road speed limit active 0: road speed limit inactive
Bit 4		Retarder control status 1: engine retarder enabled 0: engine retarder not enabled
Bit 5		AP kickdown switch 1: in kickdown position 0: not in kickdown position
Bit 6		AP low idle switch 1: in low idle position 0: not in low idle position
Bit 7		Engine parameter change
Bit 8		Reserved 1: parameters have changed 0: current parameters valid
Byte 5	---	Engine's desired RPM scaled 16 rpm/Bit - Uns/SI
Byte 6	---	Desired RPM asymmetry adjustment scaled as a ratio - Uns/SI
Byte 7	---	Checksum

If either the transmission messages or the ABS messages are enabled, DDEC shall transmit this message 20 times per second.

Engine Initialization Response

Byte 1	070	MID - Engine initialization response
Byte 2,3	---	Engine speed at idle (warm condition) scaled 0.0625 rpm/Bit - Uns/I
Byte 4	---	Percent of peak torque at idle scaled 1% of peak torque/Bit - S/SI
Byte 5,6	---	Rated engine speed scaled 0.0625 rpm/Bit - Uns/I
Byte 7	---	Percent of peak torque at rated engine speed scaled 1% of peak torque/Bit - S/SI
Byte 8,9	---	Engine speed at point 3 scaled 0.0625 rpm/Bit - Uns/I
Byte 10	---	Percent of peak torque at point 3 scaled 1% of peak torque/Bit - S/SI
Byte 11,12	---	Engine speed at point 4 scaled 0.0625 rpm/Bit - Uns/I
Byte 13	---	Percent of peak torque at point 4 scaled 1% of peak torque/Bit - S/SI
Byte 14,15	---	Engine speed at point 5 scaled 0.0625 rpm/Bit - Uns/I
Byte 16	---	Percent of peak torque at point 5 scaled 1% of peak torque/Bit - S/SI
Byte 17,18	---	Engine speed at peak torque scaled 0.0625 rpm/Bit - Uns/I
Byte 19	---	Peak torque of engine scaled 10 lb-ft/Bit - Uns/SI
Byte 20,21	---	Engine speed at high idle scaled 0.0625 rpm/Bit - Uns/I
Byte 22	---	Maximum engine override speed scaled 16 rpm/Bit - Uns/SI
Byte 23	---	Checksum

DDEC transmits this message in response to the initialization request messages defined in "Transmission Initialization Request" and "ABS/Traction Control Initialization Request."

Transmission to Powertrain Message

Byte 1	074	MID - transmission to powertrain
Byte 2	---	Control/status byte
	Bit 1,2	Override control mode 00: override disabled 01: engine speed control 10: engine torque control 11: engine speed/torque limit
	Bit 3	Retarder enable 1: enable retarder 0: disable retarder
	Bit 4	Momentary high idle enable 1: override enabled 0: override disabled
	Bit 5	Driveline engaged (ignored by DDEC) 1: driveline engaged 0: driveline disengaged
	Bit 6	Transmission retarder status (ignored by DDEC) 1: retarder active 0: retarder inactive
	Bit 7,8	Reserved
Byte 3	---	When mode is as follows 00: Not broadcast 01: Desired engine speed (LSB) scaled 0.0625 rpm/Bit - Uns/I 10: Not broadcast 11: Engine speed upper limit scaled 16 rpm /Bit - Uns/SI
Byte 4	---	When mode 00: Not broadcast 01: Desired engine speed (MSB) - scaled 0.0625 rpm/Bit - Uns/I 10: Desired torque value scaled 1% of peak torque/Bit - S/SI 11: Percent torque upper limit scaled 1% of peak torque/Bit - S/SI
Byte 5	---	Output shaft speed scaled 16 rpm/Bit - Uns/SI
Byte 6	---	Checksum

The desired speed request requires a zero droop operation, regardless of the droop calibrated for either the rated speed governor or the VSG governor. While the transmission is requesting an override control mode other than override disabled (00), the messages are expected to be repeated on a continuous basis. DDEC will maintain the most recent requested control mode until a request to disable override (00) is received or a timeout period has elapsed without any request from the transmission, at which point DDEC will revert to its normal (override disabled) state.

Requests to disable the retarder (Bit 3 of byte 2) and override momentary high idle (Bit 4 of byte 2) follow the same strategy. DDEC will maintain the most recent requested state until a new request is received or a timeout period has elapsed without any request from the transmission. The default state for the retarder is enabled and for override momentary high idle is disabled.

NOTE:

This message has a variable length.

Transmission Initialization Request

Byte 1	076	MID - transmission initialization request
Byte 2		Status/enable byte
	Bit 1	1 = request engine initialization message
	Bit 2	1 = request trans. initialization message (ignored by DDEC)
	Bit 3	1 = request ABS initialization message (ignored by DDEC)
	Bit 4	1 = request retarder initialization message
	Bit 5-7	Reserved
	Bit 8	1 = progressive shift disable
Byte 3	---	Checksum

If enabled, DDEC responds to this request with the initialization messages defined in "Engine Initialization Response" and "Retarder Initialization Response" as appropriate. Once a progressive shift indication (allow or disallow) is transmitted, this state is maintained until a subsequent request from the transmission changes the state or a new ignition cycle begins.

ABS/Traction Control To Powertrain

Byte 1	079	MID - ABS/Traction control to powertrain
Byte 2	---	Control/status byte
	Bit 1,2	Override control mode 00: override disabled 01: engine speed control 10: engine torque control 11: engine torque limit
	Bit 3	Retarder or engine control select 1: retarder control 0: engine fueling control
	Bit 4	Gear shift disable (ignored by DDEC) 1: Inhibit gear shifts 0: allow shifts
	Bit 5	Retarder disable 1: disable retarders 0: enable retarders
	Bit 6	Torque converter lock up disable (ignored by DDEC) 1: disable lock up clutch 0: enable lock up clutch
	Bit 7	Request to neutral (ignored by DDEC) 1: request de-clutch to neutral 0: allow normal operation
	Bit 8	Reserved
Byte 3	---	When mode is as follows: 00: Not broadcast 01: Desired engine speed value scaled 16 rpm/Bit - Uns/SI 10: Desired % peak torque value scaled 1% of peak torque/Bit - S/SI 11: Percent torque upper limit scaled 1% of peak torque/Bit - S/SI
Byte 4	---	Checksum

While the traction control system is requesting a override control mode other than override disabled (00), the messages are expected to be repeated on a continuous basis. DDEC will maintain the most recent requested engine control mode and/or retarder control mode until a request to disable override (00) is received or a timeout period has elapsed without any request from the traction control system, at which point DDEC will revert to its normal (override disabled) state.

Requests to disable the retarder (Bit 5 of byte 2) follow the same strategy. DDEC will maintain the most recent requested state until a new request is received or a timeout period has elapsed without any request from the traction control system. The default state for the retarder is enabled. The retarder request is honored independent of the particular control select (Bit 3 of byte 2) in effect.

NOTE:

The retarder disable request applies to all retarder types; external engine retarder, DDEC controlled engine retarder, and transmission retarder.

DDEC will ignore requests from the ABS system when the transmission type is a Meritor ESS and the transmission is performing a shift.

DDEC will honor requests for both retarder control (Bit 3 of byte 2 = 1) and engine control (Bit 3 of byte 2 = 0). For retarder control, the percent of peak torque request will be translated into engine brake low, medium and high as follows:

0%	no braking or disable retarder
1% to 33%:	low braking
34% to 66%:	medium braking
67% to 100%:	high braking

Low, medium and high braking modes only apply when DDEC controls the engine brake directly. A request of 0% torque may apply to either direct engine brake control by DDEC or indirect engine brake control.

NOTE:

This message has a variable length.

ABS/Traction Control Initialization Request

Byte 1	081	MID - ABS/Traction control initialization request
Byte 2	---	Status/enable byte
	Bit 1	1 = request engine initialization message
	Bit 2	1 = request transmission initialization message (ignored by DDEC)
	Bit 3	1 = request ABS initialization message (ignored by DDEC)
	Bit 4	1 = request retarder initialization message
	Bit 5-8	Reserved
Byte 3	---	Checksum

If enabled, DDEC responds to this request with the initialization messages defined in "Engine Initialization Response" and "Retarder Initialization Response" as appropriate.

Retarder to Powertrain

Byte 1	083	MID - Retarder to powertrain
Byte 2	---	Retarder status byte
	Bit 1	Retarder active/inactive 1: retarder active 0: retarder inactive
	Bit 2	Retarder operational status 1: retarder selected 0: not selected
	Bit 3,4	For future use
	Bit 5-8	Retarding level status 0000: Off 0101: Active in low (33%) 1010: Active in medium (66%) 1111: Active in high (100%)
Byte 3	---	Checksum

If either the transmission messages or the ABS/ASR messages are enabled and digital outputs are configured for DDEC controlled engine brake operation, DDEC shall transmit this message 10 times per second.

Retarder Initialization Response

Byte 1	084	MID - Retarder initialization response
Byte 2	---	Type of retarder
	Bit 1	Reserved - sent as 0
	Bit 2	1 = Engine compression release
	Bit 3-7	Not applicable for DDEC - sent as 0
	Bit 8	Reserved - sent as 0
Byte 3	---	Peak torque of retarder (10 lb-ft/Bit) - Uns/SI
Byte 4	---	Checksum

If either the transmission messages or the ABS/ASR messages are enabled and digital outputs are configured for DDEC controlled engine brake operation, DDEC transmits this message in response to the initialization request messages defined in "Transmission Initialization Request" and "ABS/Traction Control Initialization Request."

6.4 SAE J1939

Circuits 925 (CAN_H/J1939 [+]), 926 (CAN_L/J1939 [-]) and 927 (CAN_SHLD/J1939 Shield) as shown on the communications harness schematic are used as the J1939 communication link. See Figure 6-1.

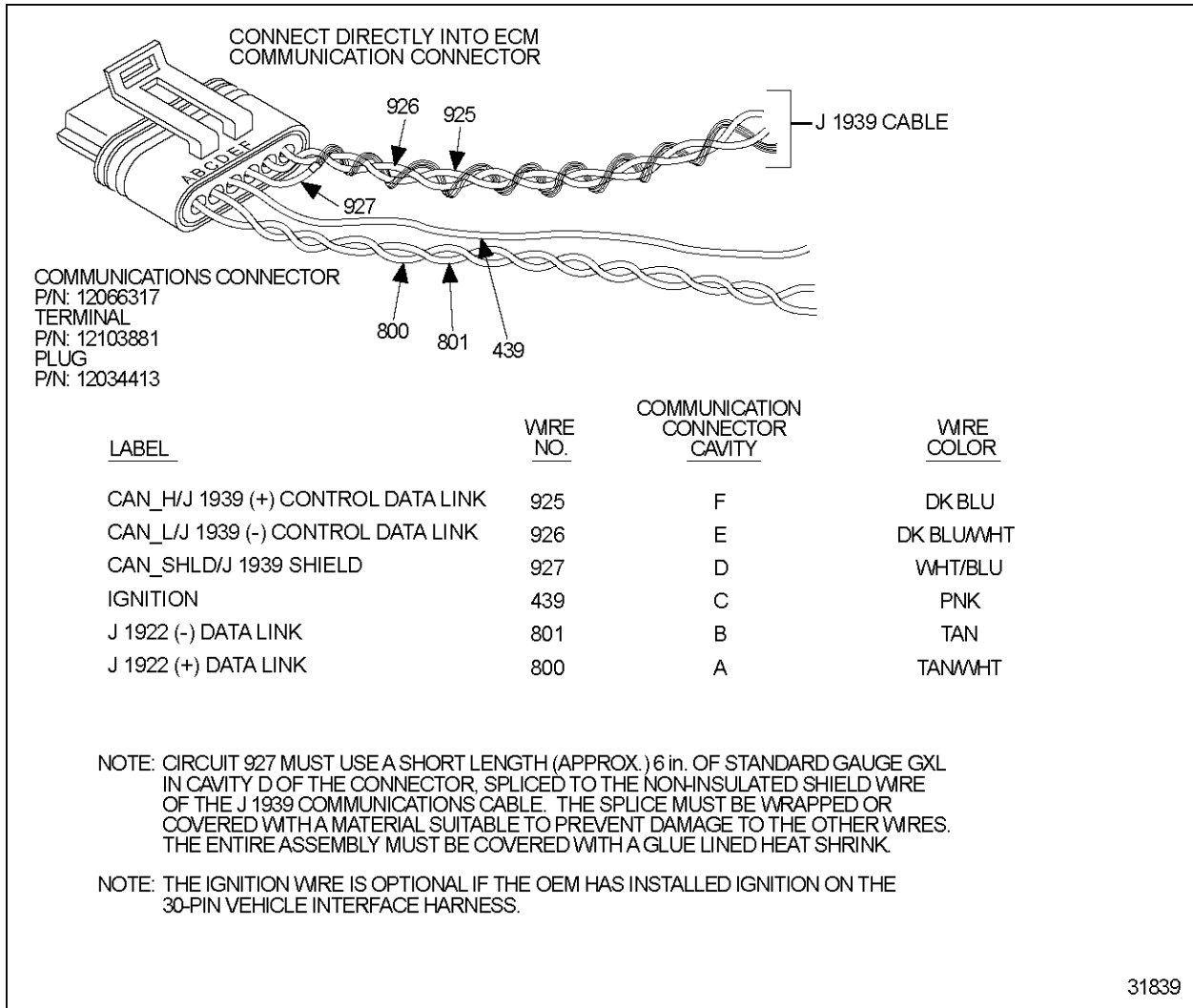


Figure 6-1 Communication Harness

6.4.1 MESSAGE FORMAT

The message format uses the parameter group number as the label for a group of parameters. Each of the parameters within the group can be expressed in ASCII, as scaled data, or as function states consisting of one or more Bits. Alphanumeric data will be transmitted with the most significant byte first. Other parameters consisting of two or more data bytes shall be transmitted least significant byte first. The type of data is also identified for each parameter.

The following sections identify the parameters that are supported by DDEC, parameter group number response definitions (refer to section 6.4.2) and parameter group number command definitions (refer to section 6.4.3).

6.4.2 SAE J1939/71 APPLICATION LAYER

The Application Layer Parameter Group Number (PGN) response definitions are described in the following sections.

Electronic Engine Controller #1 – EEC1

Transmission Rate:	Engine Speed Dependent
Data Length:	8 bytes
Data Page:	0
PDU format:	240
PDU specific:	4
Default priority:	3
PGN:	61,444 (0x00F004)
Byte : 1	Status_EEC1
Bits: 8-5	Not Defined
Bits: 4-1	Engine / Retarder Torque Mode (SPN 899)
	0000: Low Idle Governor/No Request (Default Mode)
	0001: Accelerator Pedal/Operator Selection
	0010: Cruise Control
	0011: PTO Governor
	0100: Road Speed Governor
	0101: ASR Control
	0110: Transmission Control
	0111: ABS Control
	1000: Torque Limiting
	1001: High Speed Governor
	1010: Braking System
	1011: Remote Accelerator - N/A
	1100: Not Defined
	1101: Not Defined
	1110: Other
	1111: Not Available
Byte: 2	Drivers Demand Engine - Pct Torque (SPN 512)
	Resolution: 1% / Bit, -125% offset
Byte: 3	Actual Engine - Percent Torque (SPN 513)
	Resolution: 1% / Bit, -125% offset
Bytes: 4,5	Engine Speed (SPN 190)
	Resolution: 0.125 rpm / Bit, 0 rpm offset
Byte: 6	Source address of controlling device for engine control (SPN 1483)
Byte: 7	Bits: 8-5 Not Defined
	Bits: 1-4 Engine Starter Mode – N/A
Byte: 8	Engine Demand–Percent Torque – N/A

Electronic Engine Controller #2 – EEC2

Transmission Rate : 50 ms
 Data Length: 8 bytes
 Data Page: 0
 PDU format: 240
 PDU specific: 3
 Default priority: 3
 PGN: 61,443 (0x00F003)
 Byte: 1 Status_EEC2
 Bits: 8-5 Not Defined (Transmitted as 1111)
 Bits: 4-3 AP Kickdown Switch (SPN 559)
 00: Kickdown Passive
 01: Kickdown Active
 11: Not Configured
 Bits: 2,1 AP Low Idle Switch (SPN 558)
 00: Not In Low Idle Condition
 01: In Low Idle Condition
 10: Error Detected
 11: Not Configured
 Byte: 2 Accelerator Pedal Position (TPS) (SPN 91) ■
 Resolution: 0.4% / Bit, 0% offset
 Byte: 3 Percent Load At Current Speed (SPN 92) ■
 Resolution: 1% / Bit, 0% offset
 Byte: 4 Remote Accelerator–N/A
 Bytes: 5-8 Not Defined

Idle Operation — IO ■

Transmission Rate : On Request
 Data Length: 8 bytes
 Data Page: 0
 PDU format: 254
 PDU specific: 220
 Default priority: 6
 PGN: 65,244 (0x00FEDC)
 Bytes: 1-4 Total Idle Fuel Used (SPN 236) ■
 Resolution: 0.5 L / Bit, 0 L offset
 Bytes: 5-8 Total Idle Hours (SPN 235) ■
 Resolution: 0.05 hr / Bit, 0 hr offset

Turbocharger — TC

Transmission Rate :	1 sec
Data Length:	8 bytes
Data Page:	0
PDU format:	254
PDU specific:	221
Default priority:	6
PGN:	65, 245 (0x00FEDD)
Byte: 1	Turbo Oil Pressure - N/A
Bytes: 2,3	Turbo Speed (SPN 103)
	Resolution: 4 rpm / Bit, 0 rpm offset
Byte: 4	Bits: 8–7 Turbo Oil Level Switch–N/A
	Bits: 6–1 Not Defined
Bytes: 5-8	Not Defined

Electronic Engine Controller #3 – EEC3

Transmission Rate :	250 ms
Data Length:	8 bytes
Data Page:	0
PDU format:	253
PDU specific:	211
Default priority:	6
PGN:	65,247 (0x00FEDF)
Byte: 1	Nominal Friction - Percent Torque (SPN 514)
	Resolution: 1% / Bit, -125% offset
Bytes: 2,3	Engine's Desired Operating Speed (SPN 515)
	Resolution: 0.125 rpm / Bit, 0 rpm offset
Byte 4:	Engine's Desired Operating Speed Asymmetry Adjustment (SPN 519)
	ratio 0 to 250
Byte: 5	Engine Controlled Cooling Fan Losses — Percent Torque (SPN 2978)
	Resolution: 1%/Bit, -125% offset
	NOTE: Release 32.0 or later
Bytes: 6–8	Not Defined

Vehicle Distance — VD

Transmission Rate : On Request
 Data Length: 8 bytes
 Data Page: 0
 PDU format: 254
 PDU specific: 224
 Default priority: 6
 PGN: 65,248 (0x00FEE0)
 Bytes: 1-4 Trip Distance (SPN 244)
 Resolution: 0.125 km / Bit, 0 km offset
 Bytes: 5-8 Total Vehicle Distance (SPN 245)
 Resolution: 0.125 km / Bit, 0 km offset

Idle Shutdown — Shutdown

Transmission Rate : 1 sec
 Data Length: 8 bytes
 Data Page: 0
 PDU format: 254
 PDU specific: 228
 Default priority: 6
 PGN: 65,252 (0x00FEE4)
 Byte: 1 Idle shutdown_1
 Bits: 8,7 Idle Shutdown Timer State (SPN 590)
 00: Inactive
 01: Active
 Bits: 6,5 Idle Shutdown Timer Override (SPN 592)
 00: Inactive
 01: Active
 Bits: 4,3 Driver Alert Mode (SPN 594)
 00: Inactive
 01: Active
 Bits: 2,1 Engine Has Shutdown by Idle Shutdown (SPN 593)
 00: Engine has not shutdown by idle shutdown
 01: Engine has shutdown by idle shutdown
 Byte: 2 Idle shutdown_2
 Bits: 8,7 Idle Shutdown Timer Function (SPN 591)
 00: Disabled in Calibration
 01: Enabled in Calibration
 Bits: 6-1 Not Defined
 Byte: 3 Bits: 8,7 Not Defined

	Bits: 6,5	Refrigerant High Pressure Switch- N/A
	Bits: 4,3	Refrigerant Low Pressure Switch- N/A
	Bits: 2,1	A/C High Pressure Fan Switch-N/A
Byte: 4		Lamp_commands - N/A
■ Byte: 5		Engine Shutdown_1 (SPN 1107)
	Bits: 8,7	Engine Protection Shutdown Timer State
		00:Timer not Active
		01:Timer Active
■	Bits: 6,5	Engine Protection Shutdown Override (SPN 1108)
		00:Override Off
		01:Override On
	Bits: 4,3	Engine Shutdown Approaching - N/A
■	Bits: 2,1	Engine Has Shutdown By Engine Protection System (SPN 1110)
		00:Not Shutdown
		01:Has Shutdown
Byte: 6		Engine Shutdown_2
■	Bits: 8,7	Engine Protection System Configured (SPN 1111)
		00:Not Enabled In Calibration
		01:Enabled In Calibration
	Bits: 6-1	Not Defined
Bytes: 7-8		Not Defined

■ Engine Hours, Revolutions — Hours

	Transmission Rate :	On Request
	Data Length:	8 bytes
	Data Page:	0
	PDU format:	254
	PDU specific:	229
	Default priority:	6
	PGN:	65,253 (0x00FEE5)
■	Bytes: 1-4	Total Engine Hours (SPN 247)
	Resolution:	0.05 h / Bit, 0 h offset
■	Bytes: 5-8	Total Engine Revolutions (SPN 249)
	Resolution:	1000 revs / Bit, 0 revs offset

Time/Date — TD

Transmission Rate :	On Request
Data Length:	8 bytes
Data Page:	0
PDU format:	254
PDU specific:	230
Default priority:	6
PGN:	65,254 (0x00FEE6)
Byte: 1	Seconds (SPN 959)
	Resolution: 0.25 sec / Bit, 0 sec offset
Byte: 2	Minutes (SPN 960)
	Resolution: 1 min / Bit, 0 min offset
Byte: 3	Hours (SPN 961)
	Resolution: 1 hour / Bit, 0 h offset
Byte: 4	Month (SPN 963)
	Resolution: 1 month / Bit, 0 month offset
Byte: 5	Day (see Note) (SPN 962)
	Resolution: 0.25 day / Bit, 0 day offset
Byte: 6	Year (SPN 964)
	Resolution: 1 year / Bit, 1985 year offset
Byte: 7	Local Minute Offset – N/A
Byte: 8	Local Hour Offset – N/A
Note:	The Day field represents days elapsed (e.g. 1/1/98 at 12:00 am would be 0 for byte 5 (Day) and 1/1/98 at 1:00 pm would be 2 for byte 5 and 1/15/98 at 1:00 pm would be 62 for byte 5).

Vehicle Hours — VH

Transmission Rate :	On Request
Data Length:	8 bytes
Data Page:	0
PDU format:	254
PDU specific:	231
Default priority:	6
PGN:	65,255 (0x00FEE7)
Bytes: 1-4	Total Vehicle Hours -N/A
Bytes: 5-8	Total Power Takeoff Hours (SPN 248)
	Resolution: 0.05 h / Bit, 0 h offset

■ Fuel Consumption (Liquid) — LFC

Transmission Rate : On Request
 Data Length: 8 bytes
 Data Page: 0
 PDU format: 254
 PDU specific: 233
 Default priority: 6
 PGN: 65,257 (0x00FEE9)

- Byte: 1-4 Trip Fuel (SPN 182)
 Resolution: 0.5 L / Bit, 0 L offset
- Bytes: 5-8 Total Fuel Used (SPN 250)
 Resolution: 0.5 L / Bit, 0 L offset

■ Cruise Control / Vehicle Speed Setup — CCSS

Transmission Rate : On Request
 Data Length: 8 bytes
 Data Page: 0
 PDU format: 254
 PDU specific: 237
 Default priority: 6
 PGN: 65,261 (0x00FEED)

- Byte: 1 Maximum Vehicle Speed Limit (SPN 74)
 Resolution: 1 km/h / Bit, 0 km/h offset
- Byte: 2 Cruise Control High Set Limit Speed (SPN 87)
 Resolution: 1 km/h / Bit, 0 km/h offset
- Byte: 3 Cruise Control Low Set Limit Speed (SPN 88)
 Resolution: 1 km/h / Bit, 0 km/h offset
- Bytes: 4-8 Not Defined

Engine Temperature #1— ET1

Transmission Rate :	1 sec
Data Length:	8 bytes
Data Page:	0
PDU format:	254
PDU specific:	238
Default priority:	6
PGN:	65,262 (0x00FEEE)
Byte: 1	Engine Coolant Temperature (SPN 110) Resolution: 1°C / Bit, -40°C offset
Byte: 2	Fuel Temperature (SPN 174) Resolution: 1°C / Bit, -40°C offset
Bytes: 3,4	Engine Oil Temperature (SPN 175) Resolution: 0.03125°C / Bit, -273°C offset
Bytes: 5,6	Turbo Oil Temperature -N/A
Byte: 7	Engine Intercooler Temperature (SPN 52) Resolution: 1°C / Bit, -40°C offset
Byte 8:	Engine Intercooler Thermostat Opening-N/A

Engine Fluid Level/Pressure #1 — EFL/P1

Transmission Rate :	0.5 sec
Data Length:	8 bytes
Data Page:	0
PDU format:	254
PDU specific:	239
Default priority:	6
PGN:	65,263 (0x00FEEF)
Byte: 1	Fuel Delivery Pressure (SPN 94) Resolution: 4 kPa / Bit, 0 kPa offset
Byte: 2	Extended Crankcase Blowby Pressure-N/A
Byte: 3	Engine Oil Level (SPN 98) Resolution: 0.4% / Bit, 0% offset
Byte: 4	Engine Oil Pressure (SPN 100) Resolution: 4 kPa / Bit, 0 kPa offset
Byte: 5,6	Crankcase Pressure (SPN 101) Resolution: 0.0078125 kPa / Bit (1/128 kPa / Bit), -250 kPa offset
Byte: 7	Coolant Pressure (SPN 109) Resolution: 2 kPa / Bit, 0 kPa offset
Byte: 8	Coolant Level (SPN 111) Resolution: 0.4% / Bit, 0% offset

Power Takeoff Information — PTO

Transmission Rate :	100 ms
Data Length:	8 bytes
Data Page:	0
PDU format:	254
PDU specific:	240
Default priority:	6
PGN:	65,264 (0x00FEF0)
Byte: 1	Power Takeoff Oil Temperature - N/A
Byte: 2,3	Power Takeoff Speed - N/A
Byte: 4,5	Power Takeoff Set Speed (SPN 187)
	Resolution: 0.125 rpm / Bit, 0 rpm offset
Byte: 6	Measured_PTO_1
	Bits: 8,7 Not Defined
	Bits: 6,5 Remote PTO Variable Speed Control Switch - N/A
	Bits: 4,3 Remote PTO Preprogrammed Speed Control Switch (SPN 979)
	00: Switch Off
	01: Switch On
	11: Not Configured
	Bits: 2,1 PTO Enable Switch (SPN 980)
	00: Switch Off
	01: Switch On
	11: Not Configured
Byte: 7	Measured_PTO_2
	Bits: 8,7 PTO Accelerate Switch (SPN 981)
	00: Switch Off
	01: Switch On
	11: Not Configured
	Bits: 6,5 PTO Resume Switch (SPN 982)
	00: Switch Off
	01: Switch On
	11: Not Configured
	Bits: 4,3 PTO Coast/Decelerate Switch (SPN 983)
	00: Switch Off
	01: Switch On
	11: Not Configured
	Bits: 2,1 PTO Set Switch (SPN 984)
	00: Switch Off
	01: Switch On
	11: Not Configured
Byte: 8	Not Defined

Cruise Control / Vehicle Speed — C CVS

Transmission Rate :	100 ms
Data Length:	8 bytes
Data Page:	0
PDU format:	254
PDU specific:	241
Default priority:	6
PGN:	65,265 (0x00FEF1)
Byte: 1	Measured_SW1
	Bits: 8,7 Not Defined
	Bits: 6,5 Cruise Control Pause Switch–N/A
	Bits: 4,3 Parking Brake Switch (SPN 70)
	00: Park Brake Not Set
	01: Park Brake Set
	11: Not Configured
	Bits: 2,1 Two Speed Axle Switch - N/A.
Byte: 2,3	Wheel Based Vehicle Speed (SPN 84)
	Resolution: 1/256 km/h / Bit, 0 km/h offset (1/412 mph / Bit, 0 mph offset)
Byte: 4	Measured_CC_SW1
	Bits: 8,7 Clutch Switch (SPN 598)
	00: Clutch Pedal Released
	01: Clutch Pedal Depressed
	10: Error
	11: Not Configured
	Bits: 6,5 Brake Switch (SPN 597)
	00: Brake Pedal Released
	01: Brake Pedal Depressed
	11: Not Configured
	Bits: 4,3 Cruise Control Enable Switch (SPN 596)
	00: Cruise Control Disabled
	01: Cruise Control Enabled
	10: Error
	11: Not Configured
	Bits: 2,1 Cruise Control Active (SPN 595)
	00: Cruise Control Off
	01: Cruise Control On
	11: Not Configured
Byte: 5	Measured_CC_SW2
	Bits: 8,7 Cruise Control Accelerate Switch (SPN 602)
	00: Accelerate Switch Off
	01: Accelerate Switch On

█		10: Error
█		11: Not Configured
█	Bits: 6,5	Cruise Control Resume Switch (SPN 601)
		00: Resume Switch Off
		01: Resume Switch On
█		10: Error
█		11: Not Configured
█	Bits: 4,3	Cruise Control Coast Switch (SPN 600)
		00: Coast Switch Off
		01: Coast Switch On
█		10: Error
█		11: Not Configured
█	Bits: 2,1	Cruise Control Set Switch (SPN 599)
		00: Set Switch Off
		01: Set Switch On
█		10: Error
█		11: Not Configured
█	Byte: 6	Cruise Control Set Speed (SPN 86)
		Resolution: 1 km/h / Bit, 0 km/h offset
█	Byte: 7	State_CC
█	Bits: 8-6	Cruise Control State (SPN 527)
		000: Off/Disabled
		001: Hold
		010: Accelerate
		011: Decelerate/Coast
		100: Resume
		101: Set
		110: Accelerator Override
		111: Not Available
█	Bits: 5-1	PTO State (SPN 976)
█		00000: Off/Disabled
█		00001: Hold (PTO Mode is Active)
		Note: Rel 38.0 or later
█	Byte: 8	Measured_idle_SW1
█	Bits: 8,7	Engine Shutdown Override Switch (SPN 1237)
		00: Off
		01: On
		11: Not Configured
█		Note: Rel 36.0 or later
	Bits: 6,5	Engine Test Mode Switch - N/A
	Bits: 4,3	Idle Decrement Switch - N/A
	Bits: 2,1	Idle Increment Switch - N/A

Fuel Economy (Liquid) – LFE

Transmission Rate :	100 ms
Data Length:	8 bytes
Data Page:	0
PDU format:	254
PDU specific:	242
Default priority:	6
PGN:	65,266 (0x00FEF2)
Bytes: 1,2	Fuel Rate (SPN 183)
	Resolution: 0.05 L/h / Bit, 0 L/h offset
Bytes: 3,4	Instantaneous Fuel Economy (SPN 184)
	Resolution: 1/512 km/L / Bit, 0 km/L offset
Bytes: 5,6	Average Fuel Economy (SPN 185)
	Resolution: 1/512 km/L / Bit, 0 km/L offset
Bytes: 7	Throttle Plate Position (Natural Gas) (SPN 51)
	Resolution: 0.4%/bit, 0% offset
	Note: Rel 36.0 or later
Bytes: 8	Not Defined

Ambient Conditions – AMB

Transmission Rate :	1 sec
Data Length:	8 bytes
Data Page:	0
PDU format:	254
PDU specific:	245
Default priority:	6
PGN:	65,269 (0x00FEF5)
Byte: 1	Barometric Pressure (SPN 108)
	Resolution: 0.5 kPa / Bit, 0 kPa offset
Byte: 2	Cab Interior Temperature - N/A
Bytes: 4,5	Ambient Air Temperature (SPN 171)
	Resolution: 0.03125°C / Bit, -273°C offset
Byte: 6	Air Inlet Temperature (SPN 172)
	Resolution: 1°C / Bit, -40°C offset
Bytes: 7,8	Road Surface Temperature - N/A

Inlet / Exhaust Conditions – IC

Transmission Rate :	0.5 sec
Data Length:	8 bytes
Data Page:	0
PDU format:	254
PDU specific:	246
Default priority:	6
PGN:	65,270 (0x00FEF6)
Byte: 1	Particulate Trap Inlet Pressure - N/A
Byte 2:	Boost Pressure (SPN 102) Resolution: 2 kPa / Bit, 0 kPa offset
Byte 3:	Intake Manifold Temperature (SPN 105) Resolution: 1°C / Bit, -40°C offset
Byte 4:	Air Inlet Pressure (SPN 106) Resolution: 2 kPa / Bit, 0 kPa offset
Byte 5:	Air Filter Differential Pressure (SPN 107) Resolution: 0.05 kPa / Bit, 0 kPa offset
Bytes: 6,7	Exhaust Gas Temperature (SPN 173) Resolution: 0.03125°C / Bit, -273°C offset
Byte: 8	Coolant Filter Differential Pressure - N/A

Turbocharger Information #6 – TC16

Note: Rel 36.0 or later

Transmission Rate :	1 sec
Data Length:	8 bytes
Data Page:	0
PDU format:	253
PDU specific:	211
Default priority:	6
PGN:	64,979 (0x00FDD3)
Bytes: 1,2	Turbocharger Compressor Outlet #1 Temperature (SPN 2629) Resolution: 0.03125°C/bit, —273°C offset
Bytes: 3,4	Turbocharger Compressor Outlet #2 Temperature – N/A
Bytes: 5,6	Turbocharger Compressor Outlet #3 Temperature – N/A
Bytes: 7,8	Turbocharger Compressor Outlet #4 Temperature – N/A

Exhaust Port Temperature #1 – EPT1

Transmission rate:	1 sec
Data Length:	8 bytes
Data Page:	0
PDU Format:	254
PDU Specific:	163
Default Priority:	7
PGN:	65,187 (Ox00FEA3)
Byte: 1, 2	Exhaust Gas Port 1 Temperature (SPN 1137) Resolution: 0.03125°C/bit, -273°C offset
Byte: 3, 4	Exhaust Gas Port 2 Temperature (SPN 1138) Resolution: 0.03125°C/bit, -273°C offset
Byte: 5, 6	Exhaust Gas Port 3 Temperature (SPN 1139) Resolution: 0.03125°C/bit, -273°C offset
Byte: 7, 8	Exhaust Gas Port 4 Temperature (SPN 1140) Resolution: 0.03125°C/bit, -273°C offset

Exhaust Port Temperature #2 – EPT2

Transmission Rate:	1 sec
Data Length:	8 bytes
Data Page:	0
PDU Format:	254
PDU Specific:	162
Default Priority:	7
PGN:	65,186 (Ox00FEA2)
Bytes: 1, 2	Exhaust Gas Port 5 Temperature (SPN 1141) Resolution: 0.03125°C/bit, -273°C offset
Byte: 3, 4	Exhaust Gas Port 6 Temperature (SPN 1142) Resolution: 0.03125°C/bit, -273°C offset
Byte: 5, 6	Exhaust Gas Port 7 Temperature (SPN 1143) Resolution: 0.03125°C/bit, -273°C offset
Byte: 7, 8	Exhaust Gas Port 8 Temperature (SPN 1144) Resolution: 0.03125°C/bit, -273°C offset

Exhaust Port Temperature #3 – EPT3

Transmission Rate:	1 sec
Data Length:	8 bytes
Data Page:	0
PDU Format:	254
PDU Specific:	161
Default Priority:	7
PGN:	65,185 (Ox00FEA1)

- Byte: 1, 2 Exhaust Gas Port 9 Temperature (SPN 1145)
Resolution: 0.03125°C/bit, -273°C offset
- Byte: 3, 4 Exhaust Gas Port 10 Temperature (SPN 1146)
Resolution: 0.03125°C/bit, -273°C offset
- Byte: 5,6 Exhaust Gas Port 11 Temperature (SPN 1147)
Resolution: 0.03125°C/bit, -273°C offset
- Byte: 7, 8 Exhaust Gas Port 12 Temperature (SPN 1148)
Resolution: 0.03125°C/bit, -273°C offset

Exhaust Port Temperature #4 – EPT4

Transmission Rate:	1 sec
Data Length:	8 bytes
Data Page:	0
PDU Format:	254
PDU Specific:	160
Default Priority:	7
PGN:	65, 184 (Ox00FEA0)

- Byte: 1, 2 Exhaust Gas Port 13 Temperature (SPN 1149)
Resolution: 0.03125°C/bit, -273°C offset
- Byte: 3, 4 Exhaust Gas Port 14 Temperature (SPN 1150)
Resolution: 0.03125°C/bit, -273°C offset
- Byte: 5, 6 Exhaust Gas Port 15 Temperature (SPN 1151)
Resolution: 0.03125°C/bit, -273°C offset
- Byte: 7, 8 Exhaust Gas Port 16 Temperature (SPN 1152)
Resolution: 0.03125°C/bit, -273°C offset

Vehicle Electrical Power – VEP

Transmission Rate : 1 sec
 Data Length: 8 bytes
 Data Page: 0
 PDU format: 254
 PDU specific: 247
 Default priority: 6
 PGN: 65,271 (0x00FEF7)
 Byte: 1 Net Battery Current - N/A
 Byte: 2 Alternator Current - N/A
 Bytes: 3,4 Alternator Potential (voltage) - N/A
 Bytes: 5,6 Electrical Potential (voltage) (SPN 168)
 Resolution: 0.05 V / Bit, 0 V offset
 Bytes: 7,8 Battery Potential (Voltage), Switched - N/A

Alternate Fuel #1 – A1

Transmission Rate : 500 ms
 Data Length: 8 bytes
 Data Page: 0
 PDU format: 254
 PDU specific: 253
 Default priority: 6
 PGN: 65,277 (0x00FEFD)
 Byte: 1 Blower Bypass Valve Position (SPN 72)
 Resolution: 0.4% / Bit, 0% offset
 Bytes: 2,3 Gas Supply Pressure (SPN 159)
 Resolution: 0.5 kPa/bit, 0 kPa offset
 Note: Rel 36.0 or later
 Bytes: 4-8 Not Defined

■ Auxiliary Water Pump Pressure – AWPP

Transmission Rate : 1 sec
 Data Length: 8 bytes
 Data Page: 0
 PDU format: 254
 PDU specific: 254
 Default priority: 6
 PGN: 65,278 (0x00FEFE)

■ Byte: 1 Auxiliary Pump Pressure (SPN 73)
 Resolution: 16 kPa / Bit, 0 kPa offset
 Byte: 2-8 Not Defined

■ Engine Fluid Level/Pressure #2 – EFL/P2

Transmission Rate : 500 ms
 Data Length: 8 bytes
 Data Page: 0
 PDU format: 254
 PDU specific: 219
 Default priority: 6
 PGN: 65,243 (0x00FEDB)

Bytes: 1,2 Injection Control Pressure - N/A
 ■ Bytes: 3,4 Injector Metering Rail Pressure (SPN 157)
 Resolution: 1/256 MPa / Bit, 0 MPa offset
 Bytes: 5,6 Injector Timing Rail 1 Pressure–N/A
 Bytes: 7,8 Injector Metering Rail 2 Pressure–N/A

■ High Resolution Vehicle Distance – VDHR

Transmission Rate : 1 sec
 Data Length: 8 bytes
 Data Page: 0
 PDU format: 254
 PDU specific: 193
 Default priority: 6
 PGN: 65,217 (0x00FEC1)

■ Bytes: 1-4 High Resolution Total Vehicle Distance (SPN 917)
 Resolution: 5 m / Bit, 0 m offset (16.4 ft/Bit, 0 ft offset)
 ■ Bytes: 5-8 High Resolution Trip Distance (SPN 918)
 Resolution: 5 m / Bit, 0 m offset (16.4 ft/Bit, 0 ft offset)

Electronic Engine Controller #4 – EEC4

Transmission Rate :	On Request	
Data Length:	8 bytes	
Data Page:	0	
PDU format:	254	
PDU specific:	190	
Default priority:	6	
PGN:	65,214 (0x00FEBE)	
Bytes: 1,2	Rated Engine Power (SPN 166)	■
	Resolution: 0.5 kW / Bit, 0 kW offset (0.67 hp / Bit, 0 hp offset)	
Bytes: 3,4	Rated Engine Speed (SPN 189)	■
	Resolution: 0.125 rpm / Bit, 0 rpm offset	
Bytes: 5-8	Not Defined	

■ Fan Drive – FD

Transmission Rate : 1 sec
 Data Length: 8 bytes
 Data Page: 0
 PDU format: 254
 PDU specific: 189
 Default priority: 6
 PGN: 65,213 (0x00FEBD)

■ Byte: 1 Estimated Percent Fan Speed (SPN 975)
 Resolution: 0.4% / Bit, 0% offset

Byte: 2 State_Fan_Drive

Bits: 8-5 Not Defined

■ Bits: 4-1 Fan Drive State (SPN 977)

- 0000: Fan Off
- 0001: Engine System - General
- 0010: Excessive Engine Air Temperature
- 0011: Excessive Engine Oil Temperature
- 0100: Excessive Engine Coolant Temperature
- 0101-1000: Not Defined
- 1001: Manual Control
- 1010: Transmission Retarder
- 1011: A/C System
- 1100: Timer
- 1101: Engine Brake
- 1110: Other
- 1111: Not Available

Bytes: 3,4 Fan Speed N/A

Bytes: 5-8 Not Defined

Electronic Retarder Controller #1 - ERC1

Transmission Rate :	100 ms
Data Length:	8 bytes
Data Page:	0
PDU format:	240
PDU specific:	0
Default priority:	6
PGN:	61,440 (0x00F000)
Byte : 1	Status_ERC1
	Bits: 8,7 Retarder Enable - Shift Assist Switch - N/A
	Bits: 6,5 Retarder Enable - Brake Assist Switch - N/A
	Bits: 4-1 Engine/Retarder Torque Mode (SPN 900)
	0000: No Request (Default Mode)
	0001: Accelerator Pedal/Operator Selection
	0010: Cruise Control
	0011: PTO Governor
	0100: Road Speed Governor - N/A
	0101: ASR Control
	0110: Transmission Control
	0111: ABS Control
	1000: Torque Limiting - N/A
	1001: High Speed Governor - N/A
	1010: Braking System
	1011: Remote Accelerator - N/A
	1100: Not Defined
	1101: Not Defined
	1110: Other
	1111: Not Available
Byte: 2	Actual Retarder - Percent Torque (SPN 520)
	Resolution: 1% / Bit, -125% offset
Byte: 3	Intended Retarder Percent Torque - N/A
Byte: 4	Coolant Load Increase
	Bits: 8-5 Not Defined
	Bits: 3,4 Retarder Requesting Brake Light-N/A
	Bits: 1,2 Engine Coolant Load Increase-N/A
Byte: 5	Source address of controlling device for retarder control (SPN 1480)
Byte: 6	Drivers Demand Retarder-Percent Torque-N/A
Byte: 7	Retarder Selection, non-engine-N/A
Byte: 8	Actual Maximum Available Retarder-Percent Torque-N/A

Software Identification – SOFT

Transmission Rate :	On Request
Data Length:	30 bytes
Data Page:	0
PDU format:	254
PDU specific:	218
Default priority:	6
PGN:	65,242 (0x00FEDA)
Byte: 1	Number of Software Identification Fields - 7
Byte: 2	1st digit of Cal Major Version - ASCII
Byte: 3	2nd digit of Cal Major Version - ASCII
Byte: 4	3rd digit of Cal Major Version - ASCII
Byte: 5	* - Delimiter
Byte: 6	1st digit of Cal Minor Version - ASCII
Byte: 7	2nd digit of Cal Minor Version - ASCII
Byte: 8	3rd digit of Cal Minor Version - ASCII
Byte: 9	* - Delimiter
Byte: 10	1st Digit of Cal Edit Version - ASCII
Byte: 11	2nd Digit of Cal Edit Version - ASCII
Byte: 12	3rd Digit of Cal Edit Version - ASCII
Byte: 13	* - Delimiter
Byte: 14	1st Digit of Edit Build Version - ASCII
Byte: 15	2nd Digit of Edit Build Version - ASCII
Byte: 16	3rd Digit of Edit Build Version - ASCII
Byte: 17	* - Delimiter
Byte: 18	Software Release Type - ASCII X - Experimental T - Pre-production R - Production
Byte: 19	* - Delimiter
Byte: 20	DDEC Hardware Version - ASCII 3 – DDEC III, 4 – DDEC IV, 5 – DDEC V
Byte 21:	* - Delimiter
Bytes: 22-29	ECM Serial Number - ASCII
Byte: 30	* - Delimiter

Component Identification – CI

Transmission Rate : On Request
Data Length: 37 bytes
Data Page: 0
PDU format: 254
PDU specific: 235
Default priority: 6
PGN: 65,259 (0x00FEEB)
Bytes: 1-5 DTDSC - ASCII
Byte: 6 * - Delimiter
Byte: 7-14 Engine Model Number - ASCII
Byte: 15 * - Delimiter
Byte: 16-25 Engine Serial Number - ASCII
Byte: 26 * - Delimiter
Byte: 27-36 Unit Number (VIN) - ASCII
Byte: 37 * - Delimiter

Retarder Configuration – RC

Transmission Rate : 5 sec or upon receipt of a destination specific request
 Data Length: 19 bytes
 Data Page: 0
 PDU format: 254
 PDU specific: 225
 Default priority: 6
 PGN: 65,249 (0x00FEE1)

Byte: 1 Type And Location

Bits: 8-5 Retarder Location (SPN 902)
 0000: Primary Engine Retarder For Compression Brakes
 0001: Primary Engine Retarder For Exhaust Brakes

Bits: 4-1 Retarder Type (SPN 901)
 0011: Compression Release (Engine Retarder)
 0100: Exhaust

Byte: 2 Retarder Control Method (SPN 557)

255 - when not configured
 0 - DVB
 1 - Konstantdrossel
 2 - Low/High Compression
 3 - Low/Med/High Compression

Bytes: 3, 4 Retarder Speed At Idle, Point 1- N/A

Byte: 5 Percent Torque At Idle, Point 1 - N/A

Bytes: 6, 7 Maximum Retarder Speed, Point 2 - N/A

Byte: 8 Percent Torque At Maximum Speed, Point 2 - N/A

Bytes: 9, 10 Retarder Speed At Point 3 - N/A

Byte: 11 Percent Torque At Point 3 - N/A

Bytes: 12, 13 Retarder Speed At Point 4 - N/A

Byte: 14 Percent Torque At Point 4 - N/A

Bytes: 15,16 Retarder Speed At Peak Torque, Point 5 - N/A

Bytes: 17,18 Reference Retarder Torque - N/A

Bytes: 19 Percent Torque At Peak Torque, Point 5 - N/A

Engine Configuration – EC

Transmission Rate : 5 sec, on change of torque/speed points of more than 10% since last transmission, or upon receipt of a destination specific request.

Data Length: 34 bytes

Data Page: 0

PDU format: 254

PDU specific:	227	
Default priority:	6	
PGN:	65,251 (0x00FEE3)	
Bytes: 1,2	Engine Speed At Idle, Point 1 (SPN 188)	█
	Resolution: 0.125 rpm / Bit, 0 rpm offset	
Byte: 3	Percent Torque At Idle, Point 1 (SPN 539)	█
	Resolution: 1% / Bit, -125% offset	
Bytes: 4, 5	Engine Speed At Point 2 (SPN 528)	█
	Resolution: 0.125 rpm / Bit, 0 rpm offset	
Byte: 6	Percent Torque At Point 2 (SPN 540)	█
	Resolution: 1% / Bit, -125% offset	
Bytes: 7,8	Engine Speed At Point 3 (SPN 529)	█
	Resolution: 0.125 rpm / Bit, 0 rpm offset	
Byte: 9	Percent Torque At Point 3 (SPN 541)	█
	Resolution: 1% / Bit, -125% offset	
Bytes: 10, 11	Engine Speed At Point 4 (SPN 530)	█
	Resolution: 0.125 rpm / Bit, 0 rpm offset	
Byte: 12	Percent Torque At Point 4 (SPN 542)	█
	Resolution: 1% / Bit, -125% offset	
Bytes: 13, 14	Engine Speed At Point 5 (SPN 531)	█
	Resolution: 0.125 rpm / Bit, 0 rpm offset	
Byte: 15	Percent Torque At Point 5 (SPN 543)	█
	Resolution: 1% / Bit, -125% offset	
Bytes: 16, 17	Engine Speed At High Idle, Point 6 (SPN 532)	█
	Resolution: 0.125 rpm / Bit, 0 rpm offset	
Bytes: 18, 19	(KP) Of Endspeed Governor - N/A	
Bytes: 20, 21	Reference Engine Torque (SPN 544)	█
	Resolution: 1 Nm / Bit, 0 Nm offset	
Byte: 22, 23	Maximum Momentary Engine Override Speed, Point 7 (SPN 533)	█
	Resolution: 0.125 rpm / Bit, 0 rpm offset	
Byte: 24	Maximum Momentary Engine Override Time Limit (SPN 534)	█
	Resolution: 0.1 s / Bit, 0 s offset	
Byte: 25	Requested Speed Control Range Lower Limit - 300 RPM (SPN 535)	█
	Resolution: 10 rpm / Bit, 0 rpm offset	
Byte: 26	Requested Speed Control Range Upper Limit (SPN 536)	█
	Resolution: 10 rpm / Bit, 0 rpm offset	
Byte: 27	Requested Torque Control Range Lower Limit (SPN 537)	█
	Resolution: 1% / Bit, -125% offset	
Byte: 28	Requested Torque Control Range Upper Limit (SPN 538)	█
	Resolution: 1 % / Bit, -125% offset	

- Bytes: 29–30 Extended Range Requested Speed Control Range Upper Limit (SPN 1712)
 Note: Rel 36.0 or later
 Resolution: 0.125 rpm/bit, 0 rpm offset
- Bytes: 31–32 Engine Moment of Inertia (SPN1794)
 Resolution: 0.004 kgm²/bit, 0 kgm² offset
 Note: Rel 36.0 or later
- Bytes: 33–34 Default Engine Torque Limit – N/A

Adaptive Cruise Control – ACC1

- Reception rate : 100 ms
- Data length: 8 bytes
- Data Page: 0
- PDU format: 254
- PDU specific: 111
- PGN: 65135 (0x00FE6F)
- Byte : 1 Speed of Forward Vehicle - N/A
- Byte : 2 Distance to Forward Vehicle - N/A
- Byte : 3 Adaptive Cruise Control Set Speed - N/A
- Byte : 4 ACC Status 1
 - Bits: 8,7 Not Defined
 - Bits: 6-4 Adaptive Cruise Control Set Distance Mode - N/A
 - Bits: 3-1 Adaptive Cruise Control State
 - 110: Error
 - 111: Not Available
- Byte : 5 Road Curvature - N/A
- Byte : 6 Not Defined
- Byte : 7
 - Bits: 8,7 Not Defined
 - Bits: 5,6 ACC Distance Alert Signal–N/A
 - Bits: 3,4 ACC System Shutoff Warning–N/A
 - Bits: 1,2 ACC Target Detected–N/A
- Byte : 8 Not Defined
- Note: This message is received only from an ACC device. It is not transmitted by the ECM.

Torque Speed Control — TSC1

Reception Rate :	10 ms	
Data Length:	8 bytes	
Data Page:	0	
PDU format:	0	
PDU specific:	Destination Address	
Default priority:	3	
PGN:	0 (0x000000)	
Byte : 1	Control Bits	
	Bits: 8,7	Not Defined
	Bits: 6,5	Override Control Mode Priority (SPN 897)
		00: Highest
		01: High
		10: Medium
		11: Low
	Bits: 4,3	Requested Speed Control Conditions - N/A
	Bits: 2,1	Override Control Modes (SPN 695)
		00: Override Disabled
		01: Speed Control
		10: Torque Control
		11: Speed/Torque Limit
Byte: 2,3	Requested Speed / Speed Limit (SPN 898)	
	Resolution: 0.125 rpm / Bit, 0 rpm offset	
Byte: 4	Requested Torque / Torque Limit (SPN 518)	
	Resolution: 1% / Bit, -125% offset	
		0-125% for engine torque requests
		-125-0% for retarder torque requests
Bytes: 5-8	Not Defined	

Electronic Transmission Controller #1 – ETC1

Reception Rate : 10 ms
 Data Length: 8 bytes
 Data Page: 0
 PDU format: 240
 PDU specific: 2
 Default priority: 3
 PGN: 61,442 (0x00F002)

Byte : 1 Status_ETC1

Bits: 8,7 Not Defined

Bits: 6,5 Shift in Progress (SPN 574)

00: shift is not in process

01: shift in process

11: N/A

Bits: 4,3 Torque Converter Lockup Engaged (SPN 573)

00: Torque Converter Lockup Disengaged

01: Torque Converter Lockup Engaged

Note: Rel 38.0 or later

Bits: 2,1 Driveline Engaged

00: Driveline Disengaged

01: Driveline Engaged

11: N/A

Byte: 2,3 Output Shaft Speed (SPN 191)

Resolution: 0.125 rpm / Bit, 0 rpm offset

Byte: 4 Percent Clutch Slip - N/A

Byte: 5 Command_ETC1

Bits: 8-5 Not Defined

Bits: 4-3 Progressive Shift Disabled (SPN 607)

00: Progressive Shift Is Not Disabled

01: Progressive Shift Is Disabled

11: N/A

Bits: 2,1 Momentary Engine Overspeed Enable (SPN 606)

00: Momentary Engine Overspeed Is Disabled

01: Momentary Engine Overspeed Is Enabled

11: N/A

Bytes: 6,7 Input Shaft Speed - N/A

Byte: 8 Source Address of Controlling Device for Transmission Control-N/A

6.4.3 SAE J1939/21 DATA LINK LAYER

The Data Link Layer Parameter Group number (PGN) response definitions are described in the following sections.

Acknowledge / Negative Acknowledge – ACK/NACK

Transmission Rate	As Needed
:	
Data Length:	8 bytes
Data Page:	0
PDU format:	232
PDU specific:	Destination Address
Default priority:	6
PGN:	59, 392 (0x00E800)
Byte : 1	Control Byte
	0: Positive Acknowledgment (ACK)
	1: Negative Acknowledgment (NACK)
	2: Access Denied (PGN supported but access denied)
Byte: 2	Group Function Value (if applicable)- N/A
Bytes: 3-5	Not Defined
Bytes: 6	Least Significant Byte of PGN of Requested Information
Byte: 7	Middle Byte of PGN of Requested Information
Byte: 8	Most Significant Byte of PGN of Requested Information

Requests

Transmission Rate :	As Needed
Data Length:	3 bytes
Data Page:	0
PDU format:	234
PDU specific:	Destination Address
Default priority:	6
PGN:	59,904 (0x00EA00)
Byte : 1	Least Significant Byte of PGN
Byte: 2	Byte 2 of PGN
Byte: 3	Most Significant Byte of PGN

NOTE:

It is recommended that requests occur no more than 2 or 3 times per second.

NOTE:

For any unsupported PGN that are destination specific DDEC will transmit a NACK. DDEC will not transmit a NACK to a global request.

Transport Protocol Broadcast Announce (TP.CM_BAM)

Transmission Rate:	As Required
Data Length:	8 bytes
Data Page:	0
PDU Format:	236
PDU Specific:	255
Default Priority:	7
Byte: 1	Control Byte — set to 32 for CM_BAM
Byte: 2, 3	Total Message Size, number of bytes
Byte: 4	Total number of packets
Byte: 5	Not Defined
Byte: 6–8	PGN of packeted message

Transport Protocol Data (TP.DT)

Transmission Rate:	As Required
Data Length:	8 bytes
Data Page:	0
PDU Format	235
PDU Specific:	255
Default Priority:	7

Byte: 1	Sequence Number
Byte 2–8	Packetized Data (7 bytes)

NOTE:

The last packet of a multi-packet parameter group may require less than eight data bytes. The extra bytes will be filled with 255.

NOTE:

The data packets are spaced between 50 and 200 ms.

Transport Protocol Request to Send (TP.CM_RTS)

Transmission Rate:	As Required
Data Length:	8 bytes
Data Page:	0
PDU Format:	236
PDU Specific:	Destination Address
Default Priority:	7

Byte: 1	Control Byte
	16 — Designation Specific Request_To_Send (RTS)
Bytes: 2, 3	Total Message Size, number of bytes
Byte: 4	Total Number of Packets, zero not allowed
Byte: 5	Not Defined
Bytes: 6–8	Parameter group Number (PGN)

NOTE:

The ECM does not support incoming multi-placket messages and will ignore TP.CM_RTS messages.

Transport Protocol Connection Abort (TP.ConnAbort)

Transmission Rate:	As Required
Data Length:	8 bytes
Data Page:	0
PDU Format:	236
PDU Specific:	Destination Address
Default Priority:	7

Byte: 1	Control Byte 255 — Connection Abort
Byte: 2–5	Not Defined
Bytes: 6–8	Parameter Group Number (PGN)

NOTE:

This message is sent if any of the time outs occurs or an invalid packet request occurs.

Transport Protocol End of Message (TP.EndofMsgACK)

Transmission Rate:	As Required
Data Length:	8 bytes
Data Page:	0
PDU Format:	236
PDU Specific:	Destination Address
Default Priority:	7

Byte: 1	Control Byte 19–End_of_Message Acknowledge
Bytes: 2, 3	Total Message Size, number of bytes
Byte: 4	Total Number of Packets, zero not allowed
Byte 5:	Not Defined
Bytes: 6–8	Parameter Group Number (PGN)

Transport Protocol Clear to Send (TP.CM_CTS)

Transmission Rate:	As Required
Data Length:	8 bytes
Data Page:	0
PDU Format:	236
PDU Specific:	Destination Address
Default Priority:	7

Byte: 1	Control Byte
	17 — Destination Specific Clear_to_Send (CTS)
Byte: 2	Number of packets that can be sent
Byte: 3	Next packet number to be sent
Bytes: 4-5	Not Defined
Bytes: 6-8	Parameter Group Number (PGN)

Transport Protocol Data (TP.DT)

Transmission Rate:	As Required
Data Length:	8 bytes
Data Page:	0
PDU Format:	235
PDU Specific:	Destination Address
Default Priority:	7

Byte: 1	Sequence Number
Bytes: 2-8	Packetized Data (7 Bytes)

NOTE:

The last packet of a multi-packet parameter group may require less than eighty data bytes. The extra bytes will be filled with 255.

The data packets will be spaced no more than 200 ms.

6.4.4 SAE J1939/73 DIAGNOSTIC LAYER

The Diagnostic Layer Parameter Group Number (PGN) response definitions are described in the following sections:

Active Diagnostic Trouble Codes – DM1

Note: Rel 32.0 or later

Transmission Rate:		Whenever a DTC becomes an active fault and at a normal update rate of one second or longer, and then becomes inactive, a DM1 message will be transmitted to reflect this state change. If a different DTC changes state within one second update period, a new DM1 message is transmitted to reflect this new DTC.
Data Length:		Variable
Data Page:		0
PDU Format:		254
PDU Specific:		202
Default Priority:		6
PGN:		65226 (0x00FECA)
Byte: 1	Bits: 8–7	Malfunction Indicator lamp Status–N/A
	Bits: 6–5	Red Stop Lamp Status (SPN 623) 00 – Lamp Off 01 – Lamp On
	Bits: 4–3	Amber Warning Lamp Status (SPN 624) 00 – Lamp Off 01 – Lamp On
	Bits: 2–1	Protect lamp Status–N/A
Byte: 2	Bits:8–1	Reserved for SAE assignment Lamp Status (set to 0xFF)
Byte: 3	Bits:8–1	SPN, 8 least significant bits of SPN
Byte: 4	Bits:8–1	SPN, 8 second byte of SPN
Byte: 5	Bits:8–6	SPN, 3 most significant bits
	Bits:5–1	FMI
Byte: 6	Bit: 8	SPN Conversion Method (SPN 1706)
	Bits:7–1	Occurrence Count (SPN 1216)
Byte: 7	Bits:8–1	Not Defined (Set to 0xFF)
Byte: 8	Bits:8–1	Not Defined (Set to 0xFF)

Previously Active Diagnostic Trouble Codes – DM2

Note: Rel 32.0 or later

Transmission Rate:		On Request
Data Length:		Variable
Data Page:		0
PDU Format:		254
PDU Specific:		203
Default Priority:		6
PGN:		65227 (0x00FECB)
Byte: 1	Bits: 8–7	Malfunction Indicator lamp Status–N/A
	Bits: 6–5	Red Stop Lamp Status (SPN 623) 00 – Lamp Off 01 – Lamp On
	Bits: 4–3	Amber Warning Lamp Status (SPN 624) 00 – Lamp Off 01 – Lamp On
	Bits: 2–1	Protect lamp Status–N/A
Byte: 2	Bits:8–1	Reserved for SAE assignment Lamp Status (set to 0xFF)
Byte: 3	Bits:8–1	SPN, 8 least significant bits of SPN
Byte: 4	Bits:8–1	SPN, 8 second byte of SPN
Byte: 5	Bits:8–6	SPN, 3 most significant bits
	Bits:5–1	FMI
Byte: 6	Bit: 8	SPN Conversion Method (SPN 1706)
	Bits:7–1	Occurrence Count (SPN 1216)
Byte: 7	Bits:8–1	Not Defined (Set to 0xFF)
Byte: 8	Bits:8–1	Not Defined (Set to 0xFF)

Diagnostic Data Clear/Reset of Previously Active DTCs – DM3

■ Note: Rel 33.0 or later

Transmission Rate:	On Request using PGN 59904
Data Length:	0
Data Page:	0
PDU Format:	254
PDU Specific:	204
Default Priority:	6
PGN:	65228 (00FECC)

All of the non-permanent diagnostic information pertaining to previously active (inactive) visible diagnostic trouble codes will be erased when this PG is requested. The diagnostic data associated with active trouble codes will not be affected.

Diagnostic Data Clear/Reset of Active DTCs – DM11

Note: Rel 33.0 or later

Transmission Rate:	On Request using PGN 59904
Data Length:	0
Data Page:	0
PDU Format:	254
PDU Specific:	211
Default Priority:	6
PGN:	65235 (0x00FED3)

All of the non-permanent diagnostic information pertaining to active visible diagnostic trouble codes will be erased when this PG is requested. The diagnostic data associated with previously active (inactive) trouble codes will not be affected.

Stop Start Broadcast – DM13

Transmission Rate :	As Needed
Data Length:	8 bytes
Data Page:	0
PDU format:	223
PDU specific:	Destination Address
Default priority:	3

PGN:	57,008 (0x00DF00)	
Byte : 1	SAE Primary Links	
	Bits: 8,7	Current Data Link (SPN 1230) █
		00: Stop Broadcast
		01: Start Broadcast
		11: Don't Care
	Bits: 6,5	J1587 * (SPN 608) █
		00: Stop Broadcast
		01: Start Broadcast
		11: Don't Care
	Bits: 4,3	J1922 † (SPN 622) █
		00: Stop Broadcast
		01: Start Broadcast
		11: Don't Care
	Bits: 2,1	J1939 Network #1, Primary Vehicle Network ‡ █
		(SPN 639)
		00: Stop Broadcast
		01: Start Broadcast
		11: Don't Care
Byte: 2	Other Networks #1	
	Bits: 8,7	J1939 Network #2 - N/A
	Bits: 6,5	ISO 9141 - N/A
	Bits: 4,3	J1850 - N/A
	Bits: 2,1	Other, Manufacture Specified Port - N/A
Byte: 3	Other Networks #2	
	Bits: 8,7	J1939 Network #3 - N/A
	Bits: 6-1	Not Defined
Byte: 4	Control Flags	
	Bits: 8-5	Hold Signal
		0000: All Devices (SPN 1236) █
		0001: Devices whose broadcast state has been modified
		0010-1110: Not Defined
		1111: N/A
	Bits: 4-1	Not Defined
Bytes: 5-8	Not Defined	

* Only the broadcast data for the J1587 data link will be shutdown. The ECM will still respond to requests for data.

† Only the broadcast data for the J1922 data link will be shutdown. The ECM will still respond to commands from other devices.

‡ Only the broadcast data for the J1939 data link will be shutdown. The ECM will still respond to requests for data.

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