6 COMMUNICATION PROTOCOLS

Section **Page**

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6.1 OVERVIEW

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

- Transmitting sensor information from the MCM 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 CPC 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 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

6.2 SAE J1587 DATA LINK

SAE RP J1587 defines the recommended format of messages and data being communicated between microprocessors used in heavy-duty vehicle applications. SAE J1587 Data Link + and SAE J1587 Data Link - as shown on the Vehicle Interface Harness schematic are used as the J1587 communication link. These circuits also exist in the nine-pin Diagnostic Connector, Cab for use with the diagnostic tools.

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 CPC parameters is provided within this section of the manual. CPC 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 is 128.

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 CPC.

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 Trouble Codes defined in J1587 within PID 194.

The identifiers used by CPC 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 CPC SAE J1587 DL serial communication link originated the information.
Parameter Identification Character (PID)	A PID is a single byte character used in CPC SAE J1587 DL 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 CPC

6.2.2 SAE J1708/J1587 MESSAGE PRIORITY

Each messagesent by CPC 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 SAE J1708/J1587 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

6.2.3 SAE J1587 PIDS REQUIRING ACTION

CPC 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:
CPC responds with the appropriate data provided the MID in byte (b) matches the MID stored in calibration. The primary MID for CPC is 128.

J1587 Outputs - Single Byte Parameters

PID 33 - Clutch Cylinder Position
update rate: On Request
format:

PID	Data
33	a
	a – Clutch Cylinder Position

PID 40 - Engine Retarder Switches Status
update rate: 0.2 s or on state change
format:

PID	Data	
40	a	
	a – Engine Retarder Switches Status	
	Bits 8–7:	Reserved – all bits set to 1
	Bits 6–3::	Engine Retarder Level Switch
		0 - 0 Cylinders
		1 - 2 Cylinders
		3 - 3 Cylinders
		4 - 4 Cylinders
		5 - 5 Cylinders
		6 - 6 Cylinders
		7 - 7 Cylinders
		8 - 8 Cylinders
		9 - 13 – Reserved
		14 – Error
		15 – Not Available
	Bits 2–1:	Engine Retarder Switch
		00 - Off
		01 - On
		10 - Error
		11 - Not Available

PID 41 - Cruise Control Switches Status
update rate: 1.0 s or on state change
format:

PID	Data
41	a

a – Cruise Control Switches Status

Bits 8–7: Reserved - all bits set to 1

Bits 6–5: Cruise Control On/Off Switch Status
- 00 - Off
- 01 - On
- 10 - Error
- 11 - Not Available

Bits 4–3: Cruise Control Set Switch Status
- 00 - Off
- 01 - On
- 10 - Error
- 11 - Not Available

Bits 2–1: Cruise Control Resume Switch Status
- 00 - Off
- 01 - On
- 10 - Error
- 11 - Not Available

PID 43 - Ignition Switch Status
update rate: 1.0 s or on state change
format:

PID	Data
43	a

a – Ignition Switch Status

Bits 8–7: Start Aid Contacts Status – N/A

Bits 6–5: Crank Contacts Status – N/A

Bits 4–3: Run Contacts Status
- 00 - Off
- 01 - On
- 10 - Error
- 11 - Not Available

Bits 2–1: Accessory Contacts Status – N/A

PID 44 - Attention/Warning Indicator Lamps Status
update rate: 1 time/s or 10 time/s when changing
format:

Bit: 1,2	Red Stop Lamp Status 00 - off 01 - on 10 - error 11 - Not Available
Bit: 3,4	Amber Warning Lamp Status 00 - off 01 - on 10 - error 11 - Not Available
Bit: 5-8	Reserved, All Bits set to 1

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 64 - Direction Switch Status
update rate: On request
format:

PID	Data
64	a

a – Direction Switch Status

Bits 8–7:	Reserved; Both Set to 1
Bits 6–5:	Forward Switch Status — N/A
Bits 4–3:	Neutral Switch Status 00 - Off 01 - On 10 - Error 11 - Not Available
Bits 2–1:	Reverse Switch Status — N/A

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: ECU calculated.

comments: This parameter indicates the amount of engine protection torque reduction that is in effect.

PID 69- Two-Speed Axle Switch Status

update rate: 1 time/s

format:

	Bits: 8	Two-Speed Axle Switch 0 - off 1 - on
	Bits: 1-7	All Bits set to 0

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

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 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: ECU calculated
comments: Vehicle Speed Limiting is a customer option.

PID 84 - 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

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 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

comments: Transmitted when either 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: ECU 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)

PID 94 - Fuel Delivery Pressure
update rate: 1 time/s
resolution: 0.5 psi/Bit (Uns/SI)
source: Fuel Pressure Sensor

PID 98 - Engine Oil Level
update rate: 0.1 time/s
resolution: 0.5%/Bit (Uns/SI)
source: Oil Level Sensor

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 102 - Turbo Boost Pressure (Gage)
update rate: 1 times/s
resolution: 0.125 psi/Bit (Uns/SI)
source: Turbo Boost Pressure 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)

PID 107 - Air Filter Differential Pressure
update rate: 0.1 time/s
resolution: 0.2 in.H_2O/Bit (Uns/SI)
source: Air Filter Differential Pressure Sensor

PID 108 - Barometric Pressure
update rate: 1 time/s
resolution: 0.0625 psi/Bit (Uns/SI)

PID 110 - Coolant Temperature
update rate: 1 time/s
resolution: 1°F/Bit (Uns/SI)
source: Engine Coolant Temperature Sensor
sensor range: 0 to 300°F

PID 111 - Coolant Level
update rate: 0.1 times/s
resolution: 0.5%/Bit (Uns/SI) (or full = 100%, low = 0%)
source: Engine Coolant Level Sensor
comments: If the Add Coolant Level Sensor (ACL Sensor) is installed with the Engine Protection Coolant Level Sensor (ECL Sensor), the coolant level will be:

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

If only the ECL Sensor is configured:

100%	Full
0%	Low

PID 121 - Engine Retarder Status
update rate: 5 times/s
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)

Double Byte Parameters

PID 168 - Battery Voltage
update rate: 1 time/s
resolution: 0.05 volts/Bit (Uns/I)
source: Battery voltage measured at input to CPC

PID 171 - Ambient Air Temperature
update rate: 0.1 time/s
resolution: 0.25°F/Bit (S/I)

PID 173 - Exhaust Gas Temperature (DOC Inlet Temperature)
update rate: 1.0 time/s
resolution: 0.25°F/Bit (S/I)

PID 174 - Fuel Temperature
update rate: 1 time/s
resolution: 0.25°F/Bit (S/I)
source: Supply 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: Engine 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)

PID 183 - Instantaneous Fuel Economy (MPG)
update rate: 5 times/s
resolution: 1/256 mpg/Bit (Uns/I)

PID 184 - Instantaneous Fuel Economy (MPG)
update rate: 5 times/s
resolution: 1/256 mpg/Bit (Uns/I)

PID 185 - Average Fuel Economy (MPG)
update rate: 0.1 times/s
resolution: 1/256 mpg/Bit (Uns/I)

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

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)

PID 203 - DPF Outlet Temperature
update rate: 1 times/s
resolution: 0.25°F/Bit (S/I)

PID 366- Engine Oil Level High/Low
update rate: 0.1 times/s
resolution: 0.473 L/Bit

PID 439 (255 183)- Extended Range boost Pressure
update rate: 1 times/s
resolution: 0.125 kPa/Bit (Uns/I)

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

- n - 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.
- b = 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.
- c = 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.
- 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 CPC message that exceeds 21 bytes while the engine is running, in particular PID 194, PID 196, and PID 243. If the engine is stopped, CPC 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 194 — Data: n a b c a b c a b c a b c a b c...

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

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 195 – Transmitter Data Request / Clear Count
format:

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	00--	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.

PID 196 - Diagnostic Data/count clear response
update rate: On Request only
format:

PID	Data
196	n a b c c c c c

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

a = SID or PID of a standard diagnostic code

b = Diagnostic Code Character

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

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 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

PID 234- Software Identification

update rate: On Request only
format:

PID	Data	
234	n	
	Byte: 1	Number of SW ID fields
	Byte: 2	1st digit of major_num (ASCII)
	Byte: 3	2nd digit of major_num (ASCII)
	Byte: 4	3rd digit of major_num (ASCII)
	Byte: 5	* delimiter (ASCII)
	Byte: 6	1st digit of minor_num (ASCII)
	Byte: 7	2nd digit of minor_num (ASCII)
	Byte: 8	3rd digit of minor_num (ASCII)
	Byte: 9	* delimiter (ASCII)
	Byte: 10	1st digit of edit_ver (ASCII)
	Byte: 11	2nd digit of edit_ver (ASCII)
	Byte: 12	3rd digit of edit_ver (ASCII)
	Byte: 13	* delimiter (ASCII)
	Byte: 14	1st digit of config_id (ASCII)
	Byte: 15	2nd digit of config_id (ASCII)
	Byte: 16	3rd digit of config_id (ASCII)
	Byte: 17	* delimiter (ASCII)
	Byte: 18	rel_type (ASCII)
	Byte: 19	* delimiter (ASCII)
	Byte: 20	hw_ver
	Byte: 21	* delimiter (ASCII)
	Byte: 22	edit_let (ASCII)
	Byte: 23	* delimiter (ASCII)
	Byte: 24	1st digit of diag_ver(ASCII)
	Byte: 25	2nd digit of diag_ver(ASCII)
	Byte: 26	3rd digit of diag_ver(ASCII)
	Byte: 27	* delimiter (ASCII)
	Byte: 28	1st digit of diag_variant(ASCII)
	Byte: 29	2nd digit of diag_variant(ASCII)
	Byte: 30	3rd digit of diag_variant(ASCII)
	Byte: 31	* delimiter (ASCII)
	Byte: 32	1st digit sw_year (ASCII)
	Byte: 33	2nd digit sw_year (ASCII)
	Byte: 34	* delimiter (ASCII)
	Byte: 35	1st digit sw_month (ASCII)
	Byte: 36	2nd digit sw_month (ASCII)
	Byte: 37	* delimiter (ASCII)
	Byte: 38	1st digit sw_day (ASCII)

PID 234- Software Identification

Byte: 39 2nd digit sw_day (ASCII)
Byte: 40 * delimiter (ASCII)
Byte: 41 1st digit sw_hour (ASCII)
Byte: 42 2nd digit sw_hour (ASCII)
Byte: 43 * delimiter (ASCII)
Byte: 44 1st digit sw_minute (ASCII)
Byte: 45 2nd digit sw_minute (ASCII)
Byte: 46 * delimiter (ASCII)
Byte: 47 ECU Serial Number (ASCII)
Byte: 48 ECU Serial Number (ASCII)
Byte: 49 ECU Serial Number (ASCII)
Byte: 50 ECU Serial Number (ASCII)
Byte: 51 ECU Serial Number (ASCII)
Byte: 52 ECU Serial Number (ASCII)
Byte: 53 ECU Serial Number (ASCII)
Byte: 54 ECU Serial Number (ASCII)
Byte: 55 ECU Serial Number (ASCII)
Byte: 56 ECU Serial Number (ASCII)
Byte: 57 ECU Serial Number (ASCII)
Byte: 58 ECU Serial Number (ASCII)
Byte: 59 ECU Serial Number (ASCII)
Byte: 60 * delimiter (ASCII)

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)

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 hours/Bit (Uns/LI)

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 243- Device Identification
update rate: On Request only
format:

PID	Data
243	n a b b b b b c d d d d d d d d e f f f f f f f f f f g h h h h h h h h h i
	n = number of bytes: 38
	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)
	g = delimiter : ASCII '*'
	h = unit 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)

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)

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)

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)

comment: Used to identify total engine hours the engine is operating in the following modes:
-Hand throttle VSG
-High idle using cruise switches

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)

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)

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.

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.

PID 384 - Component-Specific Request Parameter
update rate: On request only
format:

PID	Data
384	a b

a = Parameter number of the requested parameter from page 2 (transmitted module 256)

b = MID of the component from which the parameter data is requested. Only the specified component should transmit the specified parameter. If the specified component is in the MID range 0 to 127, its response is not defined in this document.

PID 448- Page 2 Multi-Section Parameter
update rate: Defined by specified sectioned parameter
format:

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

n = Byte count of data that follows this character. This excludes characters MID, PID 448, and n, but it includes a, b, c, or d type characters.

a = PID from page 2 (PIDs 256 to 510) specifying the parameter that has been selected.

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

c = Data portion of sectioned parameters. May be 1 to 13 characters in the firstpacket as byte d is transmitted only in the first packet. May be 1 to 14 characters in the middle and ending packets.

d = Total byte count of the original data. It is the same value as the byte count of the parameter being sectioned. This character is broadcast only in the first packet. The value must be greater than 16 but is limited to 224.

6.3 SAE J1939 MESSAGES AND MESSAGE FORMAT

J1939 (+), J1939 (-), and J1939 Shield are used as the J1939 communication link.

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.

The J1939 source address can be set for various components as listed in Table 6-3.

Parameter Group	Parameter	Options	Default	Access
1	EBC1 Source Address SAE J1939	0–255	33	VEPS, DRS
1	TSC1 Source Address SAE J1939	0–255	231	VEPS, DRS
1	CC1 Source Address SAE J1939	0–255	23	VEPS, DRS
1	CC2 Source Address SAE J1939	0–255	33	VEPS, DRS
1	CC3Source Address SAE J1939	0–255	49	VEPS, DRS
1	CM1 DPF Source Address SAE J1939	0–255	49	VEPS, DRS
1	CM1 Fan Source Addr1 SAE J1939	0–255	49	VEPS, DRS
1	CM1 Fan Source Addr2 SAE J1939	0–255	49	VEPS, DRS

Table 6-3 J1939 Source Address

6.3.1 SAE J1939 SUPPORTED MESSAGES

The format of SAE J1939 supported messages may be seen in the following sections.

ACC1 – Adaptive Cruise Control

Reception rate:		100 ms
Transmission rate:		1 second
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 Mode (SPN 1590)
		110: Error
		111: Not Available
Byte : 5–6	Road Curvature - N/A	
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	

ACK/NACK – Acknowledge / Negative Acknowledge

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	Reserved for assignment by SAE, send each of these bytes as “FF”
Byte: 6–8	Parameter Group Number of requested information

AMB – Ambient Conditions

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

ATI2 - Aftertreatment Intake Gas 2

Transmission Repetition Rate:	500 ms
Data Length:	8 bytes
Extended Data Page:	0
Data Page:	0
PDU format:	253
PDU specific:	180
Default priority:	6
PGN:	64948 (0xFDB4)

Bytes: 1–2 Exhaust Gas Temperature 1 (SPN 3241) – N/A

Bytes: 3–4 Particulate Trap Intake Gas Temperature (SPN 3242) (CPC Rel 2 or later)

Resolution: 0.03125°C / Bit, -273°C offset

Byte: 5 Exhaust Gas Temperature 1 Preliminary FMI (SPN 3243) – N/A

Byte: 6 Particulate Trap Intake Exhaust Gas Temperature Preliminary FMI – N/A

ATO2 - Aftertreatment Outlet Gas 2

Transmission Repetition Rate:	500 ms
Data Length:	8 bytes
Extended Data Page:	0
Data Page:	0
PDU format:	253
PDU specific:	179
Default priority:	6
PGN:	64947 (0xFDB3)

Bytes: 1–2 Exhaust Gas Temperature 3 (SPN 3245) – N/A

Bytes: 3–4 Particulate Trap Outlet Gas Temperature (SPN 3246) (CPC Rel 2 or later)

Resolution: 0.03125°C / Bit, -273°C offset

Byte: 5 Exhaust Gas Temperature 3 Preliminary FMI (SPN 3247) – N/A

Byte: 6 Particulate Trap Outlet Exhaust Gas Temperature Preliminary FMI – N/A

CCSS – Cruise Control / Vehicle Speed Setup

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	

CCVS – Cruise Control / Vehicle Speed

Transmission/Reception 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 (SPN 1633)
		00: Off
		01: On
		10: Error
		11: Take No Action
	Bits: 4,3	Parking Brake Switch (SPN 70)
		00: Park Brake Not Set
		01: Park Brake Set
		10: Error
		11: Not Configured
	Bits: 2,1	Two Speed Axle Switch (SPN 69)
		00: Low Speed Range
		01: High Speed Range
		10: Error
		11: Not Configured
Byte: 2,3	Wheel Based Vehicle Speed (SPN 84)	
	Resolution:	1/256 km/h, 0 km/h 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	Service Brake Switch (SPN 597)
		00: Brake Pedal Released
		01: Brake Pedal Depressed
		10: Error
		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
10: Error
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: Decel/Coast
100: Resume
101: Set
110: Accelerator Override
111: Not Available

Bits: 5-1 PTO State - (SPN 976)
00000: Disabled/Off
00001: Hold
00010: Remote Hold
00100: Remote Standby

00101: Set
00110: Decelerate/Coast
00111: Resume
01000: Accelerate
01001: Accelerator Override
01010: Programmed Speed 1
01011: Programmed Speed 2
01100: Programmed Speed 3
11111: Not Available

Byte: 8 Measured_Idle_SW1

Bits: 8,7 Engine Shutdown Override Switch (SPN 1237)
00: Switch Off
01: Switch On
11: Not Configured

Bits: 6,5 Engine Test Mode Switch – N/A

Bits: 4,3 Idle Decrement Switch (SPN 967)
00: Off
01: On

Bits: 2,1 Idle Increment Switch (SPN 968)
00: Off
01: On

CI – Component Identification

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	Make (SPN 586) – ASCII
Byte: 6	* - Delimiter
Bytes 7–14:	Engine Model Number (SPN 587) – ASCII
Byte: 15	* - Delimiter
Byte: 16–25	Engine Serial Number (SPN 588) – ASCII
Byte: 26	* - Delimiter
Byte: 27–36	Unit Number (Power Unit) (SPN 233) - ASCII
Byte: 37	* - Delimiter
Note:	DDEC VI also supports an alternate format of the component identification data to satisfy an AGS2 transmission.
Example:	Series 60 – DTDSC*606HG6E*00R01234567** MBE900 – MRCBN*926N07*123456** MBE4000 – MRCBN*460N07*123456**

CM1 – Cab Message1

Transmission Rate:	1 sec	
Data Length:	8 bytes	
Data Page:	0	
PDU Format:	224	
PDU Specific:	218	
Default Priority:	6	
PGN:	57, 344(0x00E00016)	
Byte: 1	Requested Percent Fan Speed (SPN 986)	
	Resolution: 0.4%/Bit, 0 offset	
Bytes: 2 – 3	Cab Interior Temperature Command – N/A	
Byte: 4		
	Bits: 2–1	Auxiliary Heater Coolant Pump Request – N/A
	Bits: 4–3	Battery Main Switch Hold Request – N/A
	Bits: 6–5	Operator Seat Direction Switch – N/A
	Bits: 8–7	Seat Belt Switch – N/A
Byte: 5		

Bits: 8–7 Vehicle Speed Governor Enable Switch — N/A

Bits: 6–5 Vehicle Limiting Speed Governor Increment Switch – N/A

Bits: 4–3 Vehicle Limiting Speed Governor Decrement Switch – N/A

Bits: 2–1 Not Defined

Byte: 6

Bits: 4–3 Particulate Trap Regeneration Force Switch (SPN 3696)
- 00: Not Active
- 01: Active
- 10: Error
- 11: Not Available

Bits: 2–1 Particulate Trap Regeneration Inhibit Switch (SPN 3695)
- 00: Not Active
- 01: Active
- 10: Error
- 11: Not Available

Byte: 7

Bits: 8–7 Request Cab Zone Heating— N/A

Bits: 6–5 Request Engine Zone Heating – N/A

Bits: 4–1 Auxiliary Heater Mode Request– N/A

Byte: 8 Selected Maximum Vehicle Speed Limit – N/A

DM1 – Active Diagnostic Trouble Codes

Transmission / Reception 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 (SPN 1213) 00: Lamp Off 01: Lamp On 10: Error 11: Not Available
	Bits: 6–5	Red Stop Lamp Status (SPN 623) 00: Lamp Off 01: Lamp On 10: Error 11: Not Available
	Bits: 4–3	Amber Warning Lamp Status (SPN 624) 00: Lamp Off 01: Lamp On 10: Error 11: Not Available
	Bits: 2–1	Protect Lamp Status (SPN 987) – N/A
Byte: 2	Bits: 8–1	Reserved for SAE assignment Lamp Status
Byte: 3	Bits: 8–1	SPN, 8 least significant bits of SPN (SPN 1214) (most significant at bit 8)
Byte: 4	Bits: 8–1	SPN, second byte of SPN (most significant at bit 8)
Byte: 5	Bits: 8–6	SPN, 3 most significant bits (most significant at bit 8)
	Bits: 5–1	FMI (SPN 1215) (most significant at bit 5)
Byte: 6	Bit: 8 Bits: 7–1	SPN Conversion Method (SPN 1706) Occurrence Count (SPN 1216)

Byte: 7	Bits: 8–1	Not Defined
Byte: 8	Bits: 8–1	Not Defined

DM2 – Previously Active Diagnostic Trouble Codes

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 (SPN 1213) 00: Lamp Off 01: Lamp On 10: Error 11: Not Available
	Bits: 6–5	Red Stop Lamp Status (SPN 623) 00: Lamp Off 01: Lamp On 10: Error 11: Not Available
	Bits: 4–3	Amber Warning Lamp Status (SPN 624) 00: Lamp Off 01: Lamp On 10: Error 11: Not Available
	Bits: 2–1	Protect Lamp Status (SPN 987) – N/A
Byte: 2	Bits: 8–1	Reserved for SAE Assignment Lamp Status
Byte: 3	Bits: 8–1	SPN, 8 least significant bits of SPN (most significant at bit 8) (SPN 1214)
Byte: 4	Bits: 8–1	SPN, second byte of SPN (most significant at bit 8) (SPN 1214)
Byte: 5	Bits: 8–6	SPN, 3 most significant bits (most significant at bit 8) (SPN 1214)
	Bits: 5–1	FMI (most significant at bit 5) (SPN 1215)
Byte: 6	Bit: 8	SPN conversion Method (SPN 1706)
	Bits: 7–1	Occurrence count (SPN 1216)
Byte: 7	Bits: 8–1	Not Defined
Byte: 8	Bits: 8–1	Not Defined

DM3 - Diagnostic Data Clear/Reset of Previously Active DTCs

Reception Rate:	On Request using PGN 59904
Data Length:	0
Data Page:	0
PDU Format:	254
PDU Specific:	204
Default Priority:	6
PGN:	65,228 (0x00FECC)

Note: 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. Upon reception of this PG request, DDEC will respond with a Positive Acknowledgement (ACK). This message clears both CPC and MCM previously active DTCs.

DM11 — Diagnostic Data Clear/Reset for Active DTCs

Reception Rate:	On Request Using PGN 59904
Data Length:	0
Data Page:	0
PDU Format:	254
PDU Specific:	211
Default Priority:	6
PGN:	65,235 (0x00FED3)

Note: 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. Upon reception of this PG request, DDEC will respond with a Positive Acknowledgement (ACK). This message clears both CPC and MCM previously active DTCs.

DM13 — Stop Start Broadcast

Reception Rate :		As Received
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) – N/A
	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 (SPN 1236) 0000: All Devices 0001: Devices whose broadcast state has been modified 0010–1110: Not Defined 1111: N/A
	Bits: 4–1	Suspended Signal – N/A
Byte: 5–6	Suspended Duration – N/A	
Byte: 7–8	SAE Reserved	

EBC1 – Electronic Brake Controller #1

Transmission/Reception Rate:		100 ms
Data Length:		8 bytes
Data Page:		0
PDU format:		240
PDU specific:		1
Default priority:		6
PGN:		61,441 (0x00F001)
Byte : 1	Status EBC1	
	Bits: 1-2	ASR Brake Control Active – N/A
	Bits: 3-4	Anti-Lock Braking (ABS) Active (SPN 563)
	Bits: 5-6	00: ABS Passive but installed 01: ABS Active 10: Reserved 11: Not Available
	Bits: 7-8	EBS Brake Switch – N/A
Byte: 2	Brake Pedal Position – N/A	
Byte: 3	Status EBC2	
	Bits: 1-2	ABS Off-Road Switch – N/A
	Bits: 3-4	ASR Off-Road Switch – N/A
	Bits: 5-6	ASR “Hill Holder” Switch – N/A
	Bits: 7-8	Traction Control Override Switch – N/A
Byte: 4	Measured Aux.1	
	Bits: 1-2	Accelerator Interlock Switch – N/A
	Bits: 3-4	Engine Derate Switch – N/A
	Bits: 5-6	Auxiliary Engine Shutdown Switch – N/A
	Bits: 7-8	Remote Accelerator Enable Switch (SPN 969) 00: Off 01: On
Byte: 5	Engine Retarder Selection (SPN 973)	
	Resolution:	0.4% / Bit, 0% Offset
Byte: 6	EBC Lamp Status – N/A	
Byte: 7	Source Address of Controlling Device for Brake Control – N/A	
Byte: 8	Not Defined	

EBC2 – Wheel Speed Information

Reception Rate :	100 ms
Data Length:	8 bytes
Data Page:	0
PDU format:	254
PDU specific:	191
Default priority:	6
PGN:	65,215
Bytes : 1, 2	Front Axle Speed (SPN 904)
	Resolution: 1/256 km/h per bit, 0 offset
Byte: 3	Relative Speed, Front Axle, Left Wheel – N/A
Byte: 4	Relative Speed, Front Axle, Right Wheel – N/A
Byte: 5	Relative Speed, Front Axle #1, Left Wheel – N/A
Byte: 6	Relative Speed, Front Axle #1, Right Wheel – N/A
Byte: 7	Relative Speed, Front Axle #2, Left Wheel – N/A
Byte: 8	Relative Speed, Front Axle #2, Right Wheel – N/A

EC – Engine Configuration

Transmission Rate :		5 sec.
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	Engine Gain (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 – N/A	

Byte: 26	Requested Speed Control Range Upper Limit – N/A
Byte: 27	Requested Torque Control Range Lower Limit – N/A
Byte: 28	Requested Torque Control Range Upper Limit – N/A
Byte 29,30	Extended Range Requested Speed Control Range Upper Limit — N/A
Byte 31,32	Engine Moment of Inertia (SPN 1794)
	Resolution: 0.004 kgm^2/Bit, 0 kgm^2/Bit Offset
Byte 33,34	Default Engine Torque Limit — N/A

EEC1 – Electronic Engine Controller #1

Transmission Rate: 10 ms
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
  - 0001: Accelerator Pedal
  - 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 (SPN 1675)
  - 0000: Start Not Requested
  - 0001: Starter Active, Gear Not Engaged
  - 0010: Starter Active, Gear Engaged
  - 0011: Start Finished; Starter Not Active After Having Been Actively Engaged
  - 0100: Starter Inhibited Due To Engine Already Running

0101: Starter Inhibited Due To Engine Not Ready For Start (preheating)
0110: Starter Inhibited Due To Driveline Engaged Or Other Transmission Inhibit
0111: Starter Inhibited Due To Active Immobilizer
1000: Starter Inhibited Due To Starter Over-Temp
1001-1011: Reserved
1100: Starter Inhibited - Reason Unknown
1101: Error
1110: Error
1111: Not Available

Byte: 8 Engine Demand–Percent Torque (SPN 2432)
Resolution: 1% / Bit, -125% offset

EEC2 – Electronic Engine Controller #2

Transmission/Reception 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: 8-7	Accelerator Pedal 2 Low Idle Switch — N/A
	Bits: 6-5	Road Speed Limit Status (SPN 1437)
		00: Active
		01: Not Active
	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 (SPN 974)	
	Resolution:	0.4% / Bit, 0% offset
Byte: 5	Accelerator Pedal Position 2 (SPN 29) — N/A	
Byte: 6	Vehicle Acceleration Rate Limit Status	
	Bits: 8–3	Not Defined
	Bits: 2–1	Vehicle Acceleration Limit Status (SPN 2979)
		00: Limit Not Active
		01: Limit Active
		10: Reserved
		11: Not Defined
Byte: 7	Actual Maximum Available Engine percent Torque – N/A	
Byte: 8	Not Defined	

EEC3 – Electronic Engine Controller #3

Transmission Rate :		250 ms
Data Length:		8 bytes
Data Page:		0
PDU format:		254
PDU specific:		223
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
Byte: 6–7	Exhaust Gas Mass (SPN 3236) — N/A	
Byte: 8	After-Treatment	
	Bits: 7-8	After-Treatment Intake Dew Point Message – N/A
	Bits: 5-6	After-Treatment Exhaust Dew Point Message – N/A
	Bits: 3-4	After-Treatment Intake Dew Point Message – N/A
	Bits: 1-2	After-Treatment Exhaust Dew Point Message – N/A

EEC4 – Electronic Engine Controller #4

Transmission Rate :		On Request
Data Length:		8 bytes
Data Page:		0
PDU format:		254
PDU specific:		190
Default priority:		7
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	

EFL/P1 – Engine Fluid Level/Pressure1

Transmission Rate :	500 ms
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: 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: 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

EFL/P2 – Engine Fluid Level/Pressure #2

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

ERC1 - Electronic Retarder Controller #1

Transmission/Reception 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 (SPN 572) 00: Retarder Brake Assist Disabled 01: Retarder Brake Assist Enabled 10: Error 11: Not Available
	Bits: 6,5	Retarder Enable - Brake Assist Switch (SPN 571) 00: Retarder Brake Assist Disabled 01: Retarder Brake Assist Enabled 10: Error 11: Not Available
	Bits: 4-1	Engine/Retarder Torque Mode (SPN 900) 0000: No Request (default) 0001: Operator Selection 0011: Cruise Control 0011: PTO Governor 0100: Road Seed 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 Defined
Byte: 2	Actual Retarder - Percent Torque (SPN 520)	
	Resolution:	1%/Bit, –125% Offset
Byte: 3	Intended Retarder Percent Torque - N/A	
Byte: 4		
	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)	

	Resolution:	1 Source Address/Bit, 0 Offset
Byte: 6	Drivers Demand Retarder–Percent Torque–N/A	
Byte: 7	Retarder Selection, non-engine (SPN 1716)	
	Resolution:	0.4%/Bit, 0 Offset
Byte: 8	Actual Maximum Available Retarder–Percent Torque–N/A	

ET1 – Engine Temperature #1

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	

ET2 – Engine Temperature #2

Transmission Rate:		1 sec
Data Length:		8 bytes
Data Page:		0
PDU format:		254
PDU specific:		164
Default priority:		6
PGN:		65,188 (00FEA416)
Bytes: 1–2	Engine Oil Temperature 2 – N/A	
Bytes: 3–4	Engine ECU Temperature (SPN 1136)	
	Resolution:	0.01325°C/Bit, –273°C offset
Bytes: 5–6	Exhaust Gas Recirculation Differential Pressure (SPN 411)	
	Resolution:	1/128 kPa/Bit, –250 kPa offset
Bytes: 7–8	Exhaust Gas Recirculation Temperature (SPN 412)	
	Resolution:	0.03125°C / Bit, -273°C offset

ETC1 – Electronic Transmission Controller #1

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: Not Available
	Bits: 4,3	Torque Converter Lockup Engaged (SPN 573)
		00: Torque Converter Lockup Disengaged
		01: Torque Converter Lockup Engaged
		11: Not Available
	Bits: 2,1	Driveline Engaged (SPN 560)
		00: Driveline Disengaged
		01: Driveline Engaged
		11: Not Available
Byte: 2,3	Output Shaft Speed (SPN 191)	
	Resolution:	0.125 rpm / Bit, 0 rpm offset
Byte: 4	Percent Clutch Slip (SPN 522)	
	Resolution:	0.4%/Bit, 0% Offset
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: Take No Action
	Bits: 2,1	Momentary Engine Overspeed Enable (SPN 606)
		00: Momentary Engine Overspeed Is Disabled
		01: Momentary Engine Overspeed Is Enabled
		11: Not Available
Bytes: 6,7	Input Shaft Speed (SPN 161)	
	Resolution:	0.125 rpm/Bit, 0 Offset
Byte: 8	Source Address of Controlling Device for Transmission Control–N/A	

ETC2 – Electronic Transmission Controller #2

Reception Rate :	100 ms
Data Length:	8 bytes
Data Page:	0
PDU format:	240
PDU specific:	5
Default priority:	6
PGN:	61,445 (0x00F005)
Byte : 1	Transmission Selected Gear (SPN 524)
	Resolution: 1 Gear Value / Bit, –125 Offset
Byte: 2,3	Transmission Actual Gear Ratio – N/A
Byte: 4	Transmission Current Gear (SPN 523)
	Resolution: 1 Gear Value/Bit, – 125 Offset
Byte: 5-6	Transmission Requested Range – N/A
Byte: 7-8	Transmission Current Range – N/A

ETC7 – Electronic Transmission Controller 7

Reception Rate :		100 ms
Data Length:		8
Data Page:		0
PDU format:		254
PDU specific:		74
Default priority:		6
PGN:		65,098
Byte : 1	Transmission Request State	
	Bits: 8,7	Transmission Requested Range Display Flash State (SPN 1849) – N/A
	Bits: 6,5	Transmission Requested Range Display Blank State (SPN 1850) – N/A
Byte: 2	Transmission Switches	
	Bits: 7,8	Transmission Shift Inhibit Indicator (SPN 1851) – N/A
	Bits: 5,6	Transmission Engine Crank Enable (SPN 2900)
		00: Cranking disabled; engine cranking is prohibited by the transmission type
		01: Cranking enabled; engine cranking is allowed by transmission
		10: Error
		11: Not Available
	Bits: 3,4	Active Shift Console Indicator (SPN 2945) – N/A
	Bits: 1,2	Transmission ready for Brake Release (SPN 3086) – N/A
Byte: 3	Transmission Mode Indicators	
	Bits: 7,8	Bits: 7,8 Transmission Mode 1 Indicator (SPN 2536) – N/A
	Bits: 5,6	Bits: 5,6 Transmission Mode 2 Indicator (SPN 2537) – N/A
	Bits: 3,4	Transmission Mode 3 Indicator (SPN 2538) – N/A
	Bits: 1,2	Transmission Mode 4 Indicator (SPN 2539) – N/A
Byte: 4	Transmission Requested Gear Feedback (SPN 3289) – N/A	
Bytes: 5,6	Not Defined	

FD – Fan Drive

Transmission Rate: 1 sec

Data Length: 8 bytes
Data Page: 0
PDU Format: 254
PDU Specific: 189
Default Priority: 6
PGN: 65, 213 (Ox00FEBD)
Byte: 1 Estimated Percent Fan Torque (SPN 975)
Resolution: 0.4%/bit, 0% offset
Byte: 2 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: Excessive Transmission Oil Temperature
0110: Excessive Hydraulic Oil Temperature
0111: Default Operation
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 (SPN 1639)
Resolution: 0.125 rpm/bit, 0 rpm offset
Bytes: 5–8 Not Defined

Hours – Engine Hours, Revolutions

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 hr/bit, 0 hr/bit offset
Bytes: 5–8	Total Engine Revolutions (SPN 249)
	Resolution: 1000 rev/bit, 0 rev/bit offset

IC1 – Inlet/Exhaust Conditions #1

Transmission Rate:	500 ms
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 / Bit Offset
Byte: 3	Intake Manifold Temperature (SPN 105)
	Resolution: 1°C / Bit, -40°C / Bit Offset
Byte: 4	Air Inlet Pressure (SPN 106)
	Resolution: 2 kPa / Bit, 0kPa / Bit Offset
Byte: 5	Air Filter Differential Pressure (SPN 107)
	Resolution: 0.05 kPa / Bit, 0 kPa Offset
Byte: 6	Exhaust Gas Temperature (SPN 173)
	Resolution: 0.03125°C / Bit, –273°C Offset
Byte: 8	Coolant Filter Differential Pressure — N/A

IO — Idle Operation

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

LFC – Fuel Consumption (Liquid)

Transmission Rate:		On Request
Data Length:		8 Bytes
Data Page:		0
PDU Format:		254
PDU Specific:		233
Default Priority:		6
PGN:		65,257 (0x00FEE9)
Bytes: 1–4	Trip Fuel (SPN 182)	
	Resolution:	0.05 L/bit, 0 L/bit offset
Bytes: 5–8	Total Fuel Used (SPN 250)	
	Resolution:	0.05 L/bit, 0 L/bit offset

LFE – Fuel Economy (Liquid)

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 km/L offset
Bytes: 3,4	Instantaneous Fuel Economy (SPN 184)
	Resolution: 1/512 km/ l/bit, o km/ l offset
Bytes: 5–6	Average Fuel Economy (SPN 185)
	Resolution: 1/512 km/ l/bit, o km/ l offset
Byte: 7	Throttle Position (SPN 51)
	Resolution: 0.4%/Bit, 0% offset
Byte: 8	Not Defined

PTC1 – Particulate Trap Control 1

Transmission Reception Rate:	1 second or on change
Data Length:	8 bytes
Extended Data Page:	0
Data Page:	0
PDU Format:	253
PDU Specific:	124
Default Priority:	6
PGN:	64, 892 (OxFD7C)

Byte: 1

Bits: 8–4 Reserved

Bits: 3–1 Particulate Trap Lamp Command (SPN 3697)
000: Off
001: On – solid
010: Reserved for SAE assignment
011: Reserved for SAE assignment
100: On – fast blink (1 HZ)
101: Reserved for SAE assignment
110: Reserved for SAE assignment
111: Not Available

Byte: 2

Bit: 8 Reserved

Bits: 7–5 Particulate Trap Status (SPN 3701) – N/A

Bits: 4–3 Particulate Trap Active Regeneration Status (SPN 3700)
00: Not Active
01: Active
10: Regeneration needed – automatically initiated active regeneration imminent
11: Not Available

Bits: 2–1 Particulate Trap Passive Regeneration Status (SPN 3699) — N/A

Byte: 3

Bits: 8–7 Particulate Trap Active Regeneration Inhibited Due to Service Brake Active (SPN 3705) – N/A

Bits: 6–5 Particulate Trap Active Regeneration Inhibited Due to Clutch (SPN 3704)
00: Not Inhibited
01: Inhibited
10: Reserved for SAE assignment
11: Not Available

Bits: 4–3 Particulate Trap Active Regeneration Inhibited Due to Inhibit Switch (SPN 3703)
00: Not Inhibited
01: Inhibited
10: Reserved for SAE assignment
11: Not Available

Bits: 2–1 Particulate Trap Active Regeneration Inhibited Status (SPN 3702)
00: Not Inhibited
01: Inhibited
10: Reserved for SAE assignment
11: Not Available

Byte 4

Bits: 8–7 Particulate Trap Active Regeneration Inhibited Due to Vehicle Speed Above Allowed Speed (SPN 3709)
00: Not Inhibited
01: Inhibited
10: Reserved for SAE assignment
11: Not Available

Bits: 6–5 Particulate Trap Active Regeneration Inhibited Due to Out of Neutral (SPN 3708) – N/A

Bits: 4–3 Particulate Trap Active Regeneration Inhibited Due to Accelerator Pedal Off Idle (SPN 3707)
00: Not Inhibited
01: Inhibited
10: Reserved for SAE assignment
11: Not Available

Bits: 2–1 Particulate Trap Active Regeneration Inhibited Due to PTO Active (SPN 3706)
00: Not Inhibited
01: Inhibited
10: Reserved for SAE assignment
11: Not Available

Byte: 5

Bits: 8–7 Particulate Trap Active Regeneration Inhibited Due to System Timeout (SPN 3713) – N/A

Bits: 6–5 Particulate Trap Active Regeneration Inhibited Due to System Fault Active (SPN 3712) – N/A

Bits: 4–3 Particulate Trap Active Regeneration Inhibited Due to Low Exhaust Gas Temperature (SPN 3711) – N/A

Bits: 2–1 Particulate Trap Active Regeneration Inhibited Due to Parking Brake Not Set (SPN 3710)
00: Not Inhibited
01: Inhibited
10: Reserved for SAE assignment
11: Not Available

Byte: 6

Bits: 8–7 Particulate Trap Active Regeneration Inhibited Due to Vehicle Speed Below Allowed Speed (SPN 3717) – N/A

Bits: 6–5 Particulate Trap Active Regeneration Inhibited Due to Engine Not Warmed Up (SPN 3716) – N/A

Bits: 4–3 Particulate Trap Active Regeneration Inhibited Due to Permanent System Lockout (SPN 3715) – N/A

Bits: 2–1 Particulate Trap Active Regeneration Inhibited Due to Temporary System Lockout (SPN 3714) – N/A

Byte: 7

Bits: 8–6 Reserved

Bits: 5–3 Exhaust System High Temperature Lamp Command (SPN 3698)
000: Off
001: On – solid
010: Reserved for SAE assignment
011: Reserved for SAE assignment
100: On – fast blink (1 HZ)
101: Reserved for SAE assignment
110: Reserved for SAE assignment
111: Not Available

Bits: 2–1 Particulate Trap Automatic Active Regeneration Initiation Configuration (SPN 3718) — N/A

Byte: 8 Not Defined

PTO – Power Takeoff Information

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	

RC – Retarder Configuration

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 (OxOOFEE1)
Byte: 1 Type and Location

Bits: 8–5 Retarder Location (SPN 902)

0000: Engine Compression Release Brake
0001: Engine Exhaust Brake
0010: Transmission Input
0011: Transmission Output
0100: Driveline
0101: Trailer
0110: Not Defined
0111: Not Defined
1000: Not Defined
1001: Not Defined
1010: Not Defined
1011: Not Defined
1100: Not Defined
1101: Not Defined
1110: Other
1111: Not Available

Bits: 4–1 Retarder Type (SPN 901)

0000: Electric/Magnetic
0001: Hydraulic
0011: Cooled Friction
0011: Compression Release (Engine Retarder)
0100: Exhaust
0101: Not Defined
0110: Not Defined
0111: Not Defined
1000: Not Defined
1001: Not Defined
1010: Not Defined
1011: Not Defined

1100: Not Defined
1101: Not Defined
1110: Other
1111: Not Available

Byte: 2 — Retarder Control Method (SPN 557)

0 – DVB
1 – Konstandrossel
2 – Low/High Compression
3 – Low/Med/High Compression
255 — Not Configured

Bytes: 3–4 — Retarder Speed at Idle, Point 1 (SPN 546)

Resolution: 0.125 rpm/bit, 0 rpm offset

Byte: 5 — Percent Torque at Idle, Point 1 (SPN 551)

Resolution: 1%/Bit, –125% offset

Bytes: 6,7 — Maximum Retarder Speed, Point 2 (SPN 548)

Resolution: 0.125 rpm/Bit, 0 rpm offset

Byte: 8 — Percent Torque at Maximum Speed, Point 2 (SPN 552)

Resolution: 1%/Bit, –125% offset

Bytes: 9,10 — Retarder Speed, Point 3 (SPN 549)

Resolution: 0.125 rpm/bit, 0 rpm offset

Byte: 11 — Percent Torque, Point 3 (SPN 553)

Resolution: 1%/Bit, –125% offset

Bytes: 12, 13 — Retarder Speed, Point 4 (SPN 550)

Resolution: 0.125 rpm/bit, 0 rpm offset

Byte: 14 — Percent Torque, Point 4 (SPN 554)

Resolution: 1%/Bit, –125% offset

Bytes: 15,16 — Retarder Speed at Peak Torque, Point 5 (SPN 547)

Resolution: 0.125 rpm/bit, 0 rpm offset

Bytes: 17,18 — Reference Retarder Torque (SPN 556)

Resolution: 1 Nm/Bit, 0 Nm offset

Byte: 19 — Percent Torque at Peak Torque, Point 5 (SPN 555)

Resolution: 1%/Bit, –125% offset

Requests

Reception Rate:	As Needed
Data Length:	3 bytes
Data Page:	0
PDU format:	234
PDU specific:	Destination Address
Default priority:	6
PGN:	59,904 (0x00EA00)

Bytes : 1 — 3 Requested PGN

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

Shutdown — Idle 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 (SPN 985) 00: Pressure Normal 01: Pressure High Fan May be Engaged
Byte: 4	Lamp_commands	
	Bits: 2, 1	Wait to Start Lamp (SPN 1081) 00: Inactive 01: Active
Byte: 5	Engine Shutdown_1	
	Bits: 8,7	Engine Protection System Timer State (SPN 1107) 00: Timer not Active 01: Timer Active
	Bits: 6,5	Engine Protection System Timer Override (SPN 1108)

		00: Override Off
		01: Override On
	Bits: 4,3	Engine Shutdown Approaching (SPN 1109)
		00: Not Approaching
		01: Approaching
	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 Configuration (SPN 1111)
		00: Not Enabled In Calibration
		01: Enabled In Calibration
	Bits: 6-1	Not Defined
Bytes: 7-8	Not Defined	

SOFT – Software Identification

Transmission Rate :	On Request
Data Length:	60 bytes
Data Page:	0
PDU format:	254
PDU specific:	218
Default priority:	6
PGN:	65,242 (0x00FEDA)
Byte: 1	Number of Software Identification Fields - 15 (SPN 965)
Byte: 2	1st digit of Major Version Level - ASCII
Byte: 3	2nd digit of Major Version Level - ASCII
Byte: 4	3rd digit of Major Version Level - ASCII
Byte: 5	* - Delimiter
Byte: 6	1st digit of Minor Version Level - ASCII
Byte: 7	2nd digit of Minor Version Level - ASCII
Byte: 8	3rd digit of Minor Version Level - ASCII
Byte: 9	* - Delimiter
Byte: 10	1st Digit of Edit Build Version - ASCII
Byte: 11	2nd Digit of Edit Build Version - ASCII
Byte: 12	3rd Digit of Edit Build Version - ASCII
Byte: 13	* - Delimiter
Byte: 14	1st Digit of Config ID - ASCII
Byte: 15	2nd Digit of Config ID - ASCII
Byte: 16	3rd Digit of Config ID - ASCII
Byte: 17	* - Delimiter
Byte: 18	Software Release Type - ASCII X - Experimental T - Pre-production R - Production
Byte: 19	* - Delimiter
Byte: 20	CPC Hardware Major Version - ASCII
Byte: 21	* - Delimiter
Byte: 22	Edit Letter - ASCII
Byte: 23	* - Delimiter
Byte: 24	1st Digit of Diagnostic Version - ASCII
Byte: 25	2nd Digit of Diagnostic Version - ASCII
Byte: 26	3rd Digit of Diagnostic Version - ASCII
Byte: 27	* - Delimiter
Byte: 28	1st Digit of Diagnostic Variant - ASCII
Byte: 29	2nd Digit of Diagnostic Variant - ASCII
Byte: 30	3rd Digit of Diagnostic Variant - ASCII
Byte: 31	* - Delimiter
Bytes: 32,33	Software Year – ASCII

Byte: 34	* - Delimiter
Bytes: 35, 36	Software Month – ASCII
Byte: 37	* - Delimiter
Bytes: 38, 39	Software Day - ASCII
Byte: 40	* - Delimiter
Bytes: 41,42	Software Hour – ASCII
Byte: 43	* - Delimiter
Bytes: 44,45	Software Minute – ASCII
Byte: 46	* - Delimiter
Bytes: 47,48	ECU Serial Number – Production Year – ASCII
Byte: 49	* - Delimiter
Bytes: 50–53	Production Day
Byte: 54	* - Delimiter
Bytes: 55–59	Production Unit
Byte: 60	* - Delimiter

TC — Turbocharger

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	Turbocharger 1 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	

TCFG2 — Transmission Configuration

Transmission Reception Rate :		On request or sender may transmit every 5 seconds until acknowledged by reception of the engine configuration message PGN 65251 SPN 1846
Data Length:		Variable
Data Page:		0
PDU format:		254
PDU specific:		75
Default priority:		6
PGN:		65, 099 (0xFE4B)
Bytes: 1–2	Transmission Torque Limit (SPN 1845)	
	Resolution:	1 Nm/Bit, 0 offset
Bytes: 3–8	Not Defined	

TCO1 — Tachograph

Reception Rate :		50 ms
Data Length:		8
Data Page:		0
PDU format:		254
PDU specific:		108
Default priority:		3
PGN:		65,132 (0x00FE6C)
Byte : 1	Driver Status	
	Bits: 7,8	Drive Recognize (SPN 1611) – N/A
	Bits: 4–6	Driver 2 Working State (SPN 1613) – N/A
	Bits: 1–3	Driver 1 Working State (SPN 1612) – N/A
Byte: 2	Driver 1	
	Bits: 7,8	Overspeed (SPN 1614) – N/A
	Bits: 4–6	Driver card, Driver 1 (SPN 1615) – N/A
	Bits: 1–3	Driver 1 Time Related States (SPN 1617) – N/A
Byte: 3	Driver 2	
	Bits: 7,8	Not Defined
	Bits: 5,6	Driver card, driver 2 (SPN 1616) – N/A
	Bits: 1–4	Driver 2 Time Related States (SPN 1618) – N/A
Byte: 4	TCO1 Information	
	Bits: 7,8	Direction Indicator (SPN 1619) – N/A
	Bits: 5,6	Tachograph Performance (SPN 1620) – N/A
	Bits: 3,4	Handling Information (SPN 1621) – N/A
	Bits: 1,2	System Event (SPN 1622) – N/A
Bytes: 5,6	Tachograph Output Shaft Speed (SPN 1623)	
	Resolution:	0.125 rpm/bit, 0 offset
Bytes: 7,8	Tachograph Vehicle Speed (SPN 1624)	
	Resolution:	1/256 km/h per bit, 0 offset

TD — Time/Date

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).	

TSC1 — Torque Speed Control

Reception Rate :		10 ms when active to the engine, 50 ms when active to the retarder
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

Reception Rate :		10 ms when active to the engine, 50 ms when active to the retarder
	Bits: 4,3	Engine Requested Speed Control Conditions (SPN 696) 00: Transient optimized for driveline disengaged and non-lockup conditions 01: Stability optimized for driveline disengaged and non-lockup conditions 10: Stability optimized for driveline engaged and/or in lockup condition 1 (e.g. vehicle driveline) 11: Stability optimized for driveline engaged and/or in lockup condition 2 (e.g. PTO driveline)
	Bits: 2,1	Override Control Modes (SPN 695) 00: Override Disabled 01: Speed Control 10: Torque Control 11: Speed/Torque Limit Control
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	
Note:	The CPC will honor TSC1 messages from the following source addresses: □ TSC1 Source Address J1939 — Customer Selectable □ Transmission (Source Address 3) □ ABS (Source Address 11) □ Adaptive Cruise Control (Source Address 42)	

VD — Vehicle Distance

Transmission Rate :		100 ms
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

VDHR – High Resolution Vehicle Distance

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)

VEP – Vehicle Electrical Power

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 (SPN 158)	
	Resolution:	0.05 V / Bit, 0 V offset

VH — Vehicle Hours

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

VI – Vehicle Identification

Transmission Rate :		On Request
Data Length:		Variable
Data Page:		0
PDU format:		254
PDU specific:		236
Default priority:		6
PGN:		65, 260 (0x00FEEC)
Bytes:	Vehicle Identification Number (SPN 237)	
1–XX	Up to 200 characters ('X' delimited)	

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