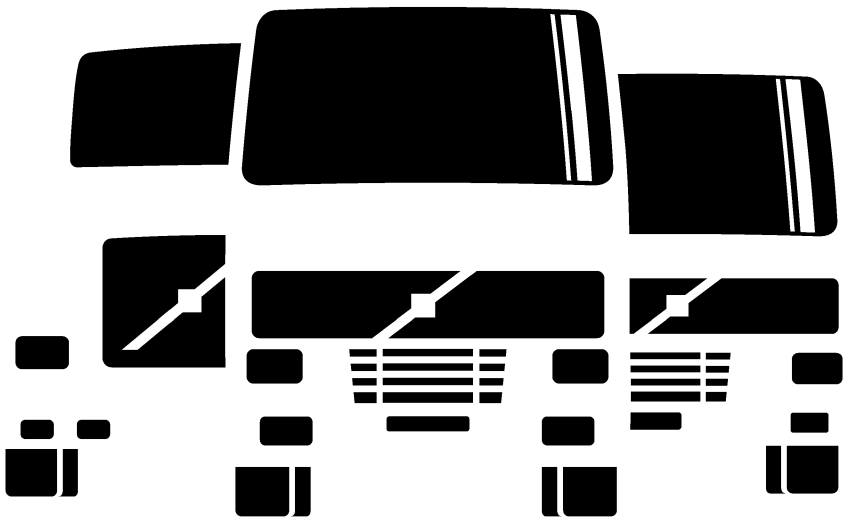
Service Manual
Trucks

Group **28**

Engine Control Module (ECM), Diagnostic Trouble Code (DTC), Guide

2010 Emissions

B13R, PREVH, PREVX



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VOLVO

Foreword

The descriptions and service procedures contained in this manual are based on designs and methods studies carried out up to August 2010.

The products are under continuous development. Vehicles and components produced after the above date may therefore have different specifications and repair methods. When this is believed to have a significant bearing on this manual, supplementary service bulletins will be issued to cover the changes.

The new edition of this manual will update the changes.

In service procedures where the title incorporates an operation number, this is a reference to an V.S.T. (Volvo Standard Times).

Service procedures which do not include an operation number in the title are for general information and no reference is made to an V.S.T.

Each section of this manual contains specific safety information and warnings which must be reviewed before performing any procedure. If a printed copy of a procedure is made, be sure to also make a printed copy of the safety information and warnings that relate to that procedure. The following levels of observations, cautions and warnings are used in this Service Documentation:

Note: Indicates a procedure, practice, or condition that must be followed in order to have the vehicle or component function in the manner intended.

Caution: Indicates an unsafe practice where damage to the product could occur.

Warning: Indicates an unsafe practice where personal injury or severe damage to the product could occur.

Danger: Indicates an unsafe practice where serious personal injury or death could occur.

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Troubleshooting

Engine Control Module (ECM) Diagnostic Trouble Codes (DTCs)

The manufacturer scan tool is the preferred tool for performing diagnostic work. Contact your local dealer for more information or visit “www.premiumtechtool.com”.

Note: The use of a scan tool is necessary to perform diagnostic work as well as clearing of any diagnostic trouble codes (DTCs). DTC(s) can no longer be cleared using the vehicles instrument cluster digital display and stalk switch control.

System Overview

Six electronic control units (ECUs) are used; the engine control module (ECM), instrument control module (ICM), Vehicle Electronic Control Unit (VECU), transmission control module (TCM), the gear selector control module (GSCM) and the aftertreatment control module (ACM). Together, these modules operate and communicate through the SAE J1939 (CAN 1) data link to control a variety of engine and vehicle cab functions. The ECM controls such things as fuel timing and delivery, fan operation, engine protection functions, engine brake operation, the exhaust gas recirculation (EGR) valve and the turbocharger nozzle. The VECU controls cruise control functions, accessory relay controls and idle shutdown functions. The ICM primarily displays operational parameters and communicates these to the other ECUs. All have the capability to communicate over the SAE J1587 data link primarily for programming, diagnostics and data reporting.

In addition to their control functions, the modules have on board diagnostic (OBD) capabilities. The OBD is designed to detect faults or abnormal conditions that are not within normal operating parameters. When the system detects a fault or abnormal condition, the fault will be logged in one or both of the modules’ memory, the vehicle operator will be advised that a fault has occurred by the illumination of the malfunction indicator lamp (MIL) and a message in the driver information display, if equipped. The module may initiate the engine shutdown procedure if the system determines that the fault could damage the engine.

In some situations when a fault is detected, the system will enter a "derate" mode. The derate mode allows continued vehicle operation but the system may substitute a sensor or signal value that may result in reduced performance. In some instances, the system will continue to function but engine power may be limited to protect the engine and vehicle. Diagnostic trouble codes (DTCs) logged in the system memory can be read later, to aid in diagnosing the problem using a diagnostic computer or through the instrument cluster display, if equipped. When diagnosing an intermittent DTC or condition, it may be necessary to use a scan tool connected to the communication port.

The use of a scan tool is necessary to perform diagnostic work as well as clearing of any diagnostic trouble codes (DTCs). DTC(s) can no longer be cleared using the vehicles instrument cluster digital display and stalk switch control. Additional data and diagnostic tests are available when a scan tool is connected to the Serial Communication Port.

For diagnostic software, contact your local dealer.

The ECM is a microprocessor based controller programmed to perform fuel injection quantity and timing control, diagnostic fault logging, and to broadcast data to other ECUs. The fuel quantity and injection timing to each cylinder is precisely controlled to obtain optimal fuel economy and reduced exhaust emissions in all driving situations.

The ECM controls the operation of the injectors, engine brake solenoid, EGR valve, turbocharger nozzle position, and cooling fan clutch based on inputs from many sensors and information received over the data links from other ECUs.

The VECU and ECM are dependent on each other to perform their specific control functions. In addition to switch and sensor data, the broadcast of data between modules also includes various calculations and conclusions that each module has developed, based on the input information it has received.

System Electronic Control Unit (ECU) Overview

The engine control module (ECM) monitors and models (using physical principles) engine parameters to monitor the engine system's performance in real time. This is performed to aid the ECM with its self diagnostic capabilities. Many sensors are used for input to the emission control system.

The system contains the following "emission critical" ECUs that are monitored;

- Engine Control Module (ECM)
- Vehicle Electronic Control Unit (VECU)
- Aftertreatment Control Module (ACM)
- Aftertreatment Nitrogen Oxides (NOx) Sensors
- Engine Variable Geometry Turbocharger (VGT) Smart Remote Actuator (SRA)

These ECUs all communicate with the ECM via data links. The VECU communicates across the SAE J1939 (CAN1) data link while the others use the SAE J1939-7 (CAN2) data link. The OBD systems use SAE J1939 data link protocol for communication with scan tools but, still are capable of communicating via the SAE J1587 data link for diagnostics. The use of a scan tool is necessary to perform diagnostic work as well as clearing of any diagnostic trouble codes (DTCs). DTC(s) can no longer be cleared using the vehicles instrument cluster digital display and stalk switch control.

There are other ECUs such as the Instrument Control Module (ICM), Transmission Control Module (TCM) and Anti-lock Brake System (ABS) Module that provide data to the emission control system or the diagnostic system but are not "emission critical".

Malfunction Indicator Lamp (MIL), Description and Location

A MIL located in the instrument cluster. This amber colored lamp is used to inform the driver that a "emission critical" malfunction signal has occurred.

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SAE J1939 Data Link Communication

The electronic control units (ECUs) that communicate on the SAE J1939 data link, communicate according to the SAE J1587 standard. The diagnostic trouble codes (DTCs) set by the ECUs contain information that is described by the following abbreviations.

SA	Source Address: Identification of a control module.
SPN	Suspect Parameter Number: Identification of a parameter (value).
FMI	Failure Mode Identifier: Identification of fault types.

SAE J1939 FMI Table

FMI	SAE Text
0	Data valid but above normal operational range - Most severe level
1	Data valid but below normal operational range - Most severe level
2	Data erratic, intermittent or incorrect
3	Voltage above normal, or shorted to high source
4	Voltage below normal, or shorted to low source
5	Current below normal or open circuit
6	Current above normal or grounded circuit
7	Mechanical system not responding or out of adjustment
8	Abnormal frequency or pulse width or period
9	Abnormal update rate
10	Abnormal rate of change
11	Root cause not known
12	Bad intelligent device or component
13	Out of calibration
14	Special instructions
15	Data valid but above normal operating range - Least severe level
16	Data valid but above normal operating range - Moderately severe level
17	Data valid but below normal operating range - Least severe level
18	Data valid but below normal operating range - Moderately severe level
19	Received network data in error
20	Reserved for SAE assignment
21	Reserved for SAE assignment
22	Reserved for SAE assignment
23	Reserved for SAE assignment
24	Reserved for SAE assignment
25	Reserved for SAE assignment
26	Reserved for SAE assignment
27	Reserved for SAE assignment
28	Reserved for SAE assignment
29	Reserved for SAE assignment
30	Reserved for SAE assignment
31	Condition exists

SAE J1587 Data Link Communication

The electronic control units (ECUs) also communicate on the SAE J1587 data link. These ECUs communicate according to the SAE J1587 standard. This standard has been extended with proprietary supplements (PPID, PSID). The diagnostic trouble codes (DTCs) set by the ECUs contain information that is described by the following abbreviations.

MID — Message Identification Description: Identification of a control module.

PID — Parameter Identification Description: Identification of a parameter (value).

PPID — Proprietary Parameter Identification Description: Unique identification of a parameter (value).

SID — Subsystem Identification Description: Identification of a component.

PSID — Proprietary Subsystem Identification Description: Unique identification of a component.

FMI — Failure Mode Identifier: Identification of fault types.

SAE J1587 FMI Table

FMI	SAE Text
0	Data valid, but above the normal working range
1	Data valid, but below the normal working range
2	Intermittent or incorrect data
3	Abnormally high voltage or short circuit to higher voltage
4	Abnormally low voltage or short circuit to lower voltage
5	Abnormally low current or open circuit
6	Abnormally high current or short circuit to ground
7	Incorrect response from a mechanical system
8	Abnormal frequency
9	Abnormal update rate
10	Abnormally strong vibrations
11	Non-identifiable fault
12	Faulty module or component
13	Calibration values outside limits
14	Special instructions
15	Reserved for future use

Diagnostic Trouble Code (DTC) Content

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ECM SPN 84, Wheel-Based Vehicle Speed – MID 128 PID 84

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 9	• Abnormal update rate	• Missing signal from VECU	• Engine derate	• SAE J1587 data link vehicle speed message does not exist, (VECU error) • VECU
FMI 10	• Abnormal rate of change	• Vehicle speed deemed inaccurate by VECU	• MIL illuminated	• Vehicle speed sensor (VSS) • VECU
FMI 13	• Out of calibration	• No vehicle speed available to VECU	• MIL illuminated	• Vehicle speed sensor (VSS) • VECU
FMI 19	• Received network data in error	• Vehicle speed deemed inaccurate by VECU	• MIL illuminated	• Vehicle speed sensor (VSS) • VECU

ECM SPN 91, Accelerator Pedal Position 1 – MID 128 PID 91

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 9	• Abnormal update rate	• Missing signal from VECU	• N/A	• SAE J1587 data link pedal information not available
FMI 10	• Abnormal rate of change	• Pedal position deemed inaccurate by VECU	• MIL illuminated	• Accelerator pedal sensor fault
FMI 13	• Out of calibration	• Pedal not connected to VECU	• MIL illuminated	• Accelerator pedal sensor fault
FMI 19	• Received network data in error	• Pedal position deemed inaccurate by VECU	• MIL illuminated	• Accelerator pedal sensor fault

ECM SPN 94, Engine Fuel Delivery Pressure – MID 128 PID 94

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	• Voltage above normal, or shorted to high source	• Low fuel pressure sensor signal line voltage	• N/A	• Damaged contacts in harness • Faulty fuel pressure sensor • Open circuit.
FMI 5	• Current below normal or open circuit	• Low fuel pressure sensor signal line voltage	• N/A	• Damaged contacts in harness • Faulty fuel pressure sensor

FMI 7	• Mechanical system not responding properly	• Drop in fuel pressure	• Engine derate	• Clogged fuel filter • Faulty fuel pressure sensor • Leaking fuel line or fitting • Poor fuel pump response
FMI 13	• Out of Calibration	• Sensor indicates a invalid value	• N/A	• Wiring harness • Faulty fuel pressure sensor • Clogged fuel filter
FMI 15	• Data valid but above normal operating range - Least severe level	• Sensor indicates a invalid value	• N/A	• Wiring harness • Faulty fuel pressure sensor
FMI 17	• Data valid but below normal operating range - Least severe level	• Sensor indicates a invalid value	• N/A	• Wiring harness • Faulty fuel pressure sensor • Clogged fuel filter
FMI 18	• Data valid but below normal operating range - Moderately severe level	• Drop in fuel pressure	• Engine derate	• Clogged fuel filter • Faulty fuel pressure sensor • Leaking fuel line or fitting • Poor fuel pump response

ECM SPN 97, Water in Fuel Indicator – MID 128 PID 97

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	• Data valid but above normal operational range - Most severe level	• Water in fuel is indicated	• Uneven running • Engine stalling	• Water in fuel
FMI 3	• Voltage above normal, or shorted to high source	• N/A	• Undetected water in fuel supply • Uneven running • Engine stalling	• Open circuit
FMI 4	• Voltage below normal, or shorted to low source	• N/A	• Undetected water in fuel supply • Uneven running	• Short to ground • Open circuit • Faulty sensor

ECM SPN 98, Engine Oil Level – MID 128 PID 98

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 1	• Data valid but above normal operational range	• Critically below range	• Red Stop or yellow Check lamps illuminated dependent of severity	• Low oil level leakage • Critically low oil level

FMI 4	• Voltage below normal, or shorted to low source	• Short Circuit - Positive side	• Oil level can not be measured	• Engine Oil Level (EOL) sensor failure • Faulty harness
FMI 5	• Current below normal or open circuit	• Short Circuit +, Positive side • Open Circuit +, Positive side • Open Circuit- Negative side	• Oil level can not be measured	• Engine Oil Level (EOL) sensor failure • Faulty harness
FMI 18	• Data valid but below normal operating range - Moderately severe level	• Moderately below range • Critically below range	• Red Stop or yellow Check lamps illuminated dependent of severity	• Low oil level leakage • Moderately low oil level

ECM SPN 100, Engine Oil Pressure – MID 128 PID 100

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 1	• Data valid but below normal operational range	• Critically below range	• Engine derate • Low pressure • Red Stop lamp illuminated	• Oil leakage • Broken oil pump • Clogged oil system
FMI 3	• Voltage below normal or shorted low	• Short Circuit +, Measuring line • Open Circuit, Ground line	• Oil pressure shows 0 in the cluster, engine is running • Yellow Check lamps illuminated	• Engine Oil Pressure (EOP) sensor failure • Faulty harness
FMI 5	• Current below normal or open circuit	• Open Circuit +, 5V Supply line • Short Circuit -, Measuring line • Open Circuit, Measuring line	• Oil pressure shows 0 in the cluster, engine is running • Yellow Check lamps illuminated	• Engine Oil Pressure (EOP) sensor failure • Faulty harness
FMI 13	• Out of Calibration	• Sensor indicates a invalid value	• Oil pressure shows 0 in the cluster, engine is running	• Engine Oil Pressure (EOP) sensor failure • Faulty harness
FMI 15	• Data valid but above normal operating range - Least severe level	• Sensor indicates a invalid value	• Oil pressure shows 0 in the cluster, engine is running	• Engine Oil Pressure (EOP) sensor failure • Faulty harness
FMI 17	• Data valid but below normal operating range - Least severe level	• Sensor indicates a invalid value	• Oil pressure shows 0 in the cluster, engine is running	• Engine Oil Pressure (EOP) sensor failure • Faulty harness

ECM SPN 102, Engine Intake Manifold 1 Pressure – MID 128 PID 102

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 2	• Data erratic, intermittent or incorrect	• Intake Manifold Pressure Sensor output is too high or too low	• Engine derate • MIL lamp illuminated	• Faulty harness • Intake Manifold Pressure sensor
FMI 3	• Voltage above normal, or shorted to high source	• A short to battery in the metering circuit • An open in the ground circuit of the Intake Manifold Pressure Sensor	• Engine derate • MIL lamp illuminated	• Faulty harness • Harness connectors • Intake Manifold Pressure sensor
FMI 5	• Current below normal or open circuit	• A short to ground in the harness • An open in the 5 volt supply circuit • An open in the metering circuit	• Engine derate • MIL lamp illuminated	• Faulty harness • Harness connectors • Intake Manifold Pressure sensor
FMI 12	• Bad intelligent device or component	• Intake Manifold Pressure sensor output is too high • Sensor indicates a invalid value	• Engine derate • MIL lamp illuminated	• Faulty harness • Intake Manifold Pressure sensor
FMI 13	• Out of Calibration	• Sensor indicates a invalid value	• Engine derate • MIL lamp illuminated	• Faulty harness • Harness connectors • Intake Manifold Pressure sensor
FMI 14	• Special instructions	• Intake Manifold Pressure sensor output is too low • Sensor indicates a invalid value	• Engine derate • MIL lamp illuminated	• Faulty harness • Intake Manifold Pressure sensor • Inlet air leakage
FMI 15	• Data valid but above normal operating range - Least severe level	• Intake Manifold Pressure sensor output is too high	• Engine derate • MIL lamp illuminated	• Faulty harness • Harness connectors • Intake Manifold Pressure sensor
FMI 17	• Data valid but below normal operating range - Least severe level	• Sensor indicates a invalid value	• Engine derate • MIL lamp illuminated	• Faulty harness • Harness connectors • Intake Manifold Pressure sensor

ECM SPN 103, Engine Turbocharger 1 Speed – MID 128 PID 103

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 9	• Abnormal update rate	• A fault is logged if the Turbocharger Speed Sensor signal is lost	• Engine derate • MIL illuminated	• Faulty harness • Faulty harness connector • Turbocharger Speed Sensor

ECM SPN 105, Engine Intake Manifold 1 Temperature – MID 128 PID 105

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	• Data valid but above normal operational range - Most severe level	• Sensor indicates a invalid value	• Engine derate • MIL illuminated	• Poor cooling • Extreme running conditions
FMI 2	• Data erratic, intermittent or incorrect	• The Intake Manifold Temperature sensor output is too high or too low	• Engine derate • MIL illuminated	• Poor cooling • Extreme running conditions • Engine Intake Manifold sensor • Faulty harness • Faulty harness connector • Ambient Air Temperature sensor
FMI 4	• Voltage below normal, or shorted to low source	• N/A	• Difficult to start in cold climates • Minor cold engine smoke • Engine derate • MIL illuminated	• Engine Intake Manifold sensor • Faulty harness • Faulty harness connector
FMI 5	• Current below normal or open circuitt	• Possible short to sensor	• Difficult to start in cold climates • Engine derate • MIL illuminated	• Engine Intake Manifold sensor • Faulty harness • Faulty harness connector
FMI 13	• Out of Calibration	• The sensor output is showing a constant value	• Engine derate • Minor cold engine smoke • MIL illuminated	• Engine Intake Manifold sensor • Faulty harness • Faulty harness connector
FMI 17	• Data valid but below normal operating range - Least severe level	• The sensor output is showing a constant value	• Engine derate • Minor cold engine smoke • MIL illuminated	• Engine Intake Manifold sensor • Faulty harness • Faulty harness connector

ECM SPN 108, Barometric Pressure – MID 128 PID 108

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 2	• Data erratic, intermittent or incorrect	• Barometric Pressure sensor output is too high or too low	• Minor engine derate • MIL illuminated	• Faulty Sensor • Faulty Engine Control Module
FMI 3	• Voltage above normal, or shorted to high source	• Short to battery on the metering side	• MIL illuminated	• Internal fault in the Engine Control Module • Faulty Sensor
FMI 4	• Voltage below normal, or shorted to low source	• A short to ground on the metering side	• MIL illuminated	• Internal fault in the Engine Control Module • Faulty Sensor

ECM SPN 110, Engine Coolant Temperature – MID 128 PID 110

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	• Data valid but above normal operational range - Most severe level	• Coolant temperature indicates critical limit	• Engine derate • Red Stop or yellow Check lamps illuminated dependent of severity	• Extreme driving condition • Faulty coolant thermostat • Malfunctioning fan • Blocked radiator
FMI 2	• Data erratic, intermittent or incorrect	• Engine Coolant Temperature sensor output is too high or too low	• May affect driveability in extreme cases • MIL illuminated	• Faulty Sensor • Faulty harness • Faulty coolant thermostat
FMI 4	• Voltage below normal or shorted low	• Engine Coolant Temperature sensor voltage too low	• Difficult to start in cold climates • Idle run regulation is deteriorated • MIL illuminated	• Faulty Sensor • Faulty harness
FMI 5	• Current below normal or open circuit	• N/A	• Difficult to start in cold climates • Idle run regulation is deteriorated • MIL illuminated	• Faulty Sensor • Faulty harness
FMI 10	• Abnormal rate of change	• Engine Coolant Temperature sensor output is showing a constant value	• May affect vehicle driveability • MIL illuminated	• Faulty Sensor • Faulty harness
FMI 13	• Out of Calibration	• Sensor out of range • Sensor indicates a invalid value	• MIL illuminated	• Faulty Sensor

FMI 16	• Data valid but above normal operating range - Moderately severe level	• Coolant temperature indicates moderate upper limit	• Engine derate • Yellow Check lamp illuminated	• Extreme driving condition • Faulty coolant thermostat • Malfunctioning fan • Blocked radiator
FMI 17	• Data valid but below normal operating range - Least severe level	• Sensor out of range • Sensor indicates a invalid value	• MIL illuminated	• Faulty Sensor

ECM SPN 111, Engine Coolant Level – MID 128 PID 111

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 1	• Data valid but below normal operational range - Most severe level	• Critically below range • Coolant level can not be detected	• Engine derate • Red Stop lamp illuminated • Coolant level can not be detected	• Coolant level below range • Faulty harness
FMI 3	• Voltage above normal, or shorted to high source	• Short Circuit +, measuring line • Coolant level can not be detected	• Coolant level can not be detected • Yellow Check lamp illuminated	• Faulty harness • Faulty harness connector • Faulty level sensor
FMI 4	• Voltage below normal, or shorted to low source	• Short Circuit -, measuring line • Coolant level can not be detected	• Coolant level can not be detected • Yellow Check lamp illuminated	• Faulty harness • Faulty harness connector • Faulty level sensor
FMI 5	• Current below normal or open circuit	• Open Circuit • Coolant level can not be detected	• Coolant level can not be detected • Yellow Check lamp illuminated	• Faulty harness • Faulty harness connector • Faulty level sensor
FMI 14	• Special instructions	• Sensor out of range • Sensor indicates a invalid value	• Coolant level can not be detected • Yellow Check lamp illuminated	• Faulty harness • Faulty harness connector • Faulty level sensor
FMI 18	• Data valid but below normal operating range - Moderately severe level	• Sensor out of range • Sensor indicates a invalid value	• Coolant level can not be detected • Yellow Check lamp illuminated	• Faulty harness • Faulty harness connector • Faulty level sensor

ECM SPN 153, Engine High Resolution Crankcase Pressure – MID 128 PID 153/PSID 23

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	• Data valid but above normal operational range - Most severe level	• Out of range, max voltage, illegal • Critically Above Range	• Red Stop lamp illuminated • Forced idle • Engine shut down	• Piston ring blow-by
FMI 2	• Data erratic, intermittent or incorrect	• Crankcase pressure indication to high or to low a value	• MIL illuminated	• Faulty Crank Case Pressure senor • Faulty harness
FMI 3	• Voltage above normal or shorted to high source	• Short Circuit +, Measuring line • Open Circuit, Ground line	• MIL illuminated • Yellow Check lamp illuminated	• Faulty Crank Case Pressure senor • Faulty harness
FMI 5	• Current below normal or open circuit	• Open Circuit +, 5V Supply Line • Short Circuit -, measuring line • Open Circuit, measuring line	• MIL illuminated • Yellow Check lamp illuminated	• Faulty Crank Case Pressure senor • Faulty harness
FMI 7	• Mechanical system not responding or out of adjustment	• Leakage detected in the crankcase ventilation system	• MIL illuminated	• Faulty separator, hoses or pipes
FMI 13	• Out of Calibration	• Sensor out of range • Sensor indicates a invalid value	• MIL illuminated	• Faulty Sensor
FMI 15	• Data valid but above normal operating range - Least severe level	• Sensor out of range • Sensor indicates a invalid value	• MIL illuminated	• Faulty Sensor
FMI 17	• Data valid but below normal operating range - Least severe level	• Sensor out of range • Sensor indicates a invalid value	• MIL illuminated	• Faulty Sensor

ECM SPN 158, Keyswitch Battery Potential – MID 128 PID 158/PSID 124

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	• Data valid but above normal operational range	• Aftertreatment control module (ACM) battery voltage too high	• N/A	• Charging system fault • External charger • ACM

FMI 1	• Data valid but below normal operational range	• Aftertreatment control module (ACM) battery voltage too low	• Starter will not crank	• Charging system fault • Battery • Ground connection
FMI 3	• Voltage above normal, or shorted to high source	• Engine control module (ECM) battery voltage too high	• N/A	• Charging system fault • External charger • ECM
FMI 4	• Voltage below normal, or shorted to low source	• Engine control module (ECM) battery voltage too low	• Starter will not crank	• Charging system fault • Battery • Ground connection
FMI 16	• Data valid but above normal operating range - Moderately severe level	• Aftertreatment control module (ACM) battery voltage too high	• N/A	• Charging system fault • External charger • ACM
FMI 18	• Data valid but below normal operating range - Moderately severe level	• Aftertreatment control module (ACM) battery voltage too low	• Starter will not crank	• Charging system fault • Battery • Ground connection

ECM SPN 171, Ambient Air Temperature (AAT) – MID 128 PID 171

Type of fault:	**FMI Description:**	**Fault Condition:**	**Possible Symptoms:**	**Possible Cause:**
FMI 2	• Data erratic, intermittent or incorrect	• Key ON, AAT message missing on SAE J1939 and SAE J1587 data links	• N/A	• Faulty instrument cluster • Faulty harness
FMI 9	• Abnormal Update Rate	• Key ON, AAT message missing on SAE J1587 data link	• N/A	• Faulty instrument cluster • Faulty harness
FMI 10	• Abnormal rate of change	• AAT sensor signal fault	• MIL illuminated	• Faulty instrument cluster
FMI 12	• Bad intelligent device or component	• Loss of SAE J1939 data link communication between engine control module (ECM) and instrument cluster control module	• MIL illuminated	• Faulty instrument cluster • Faulty harness

FMI 13	• Out of calibration	• AAT sensor signal fault • No AAT calculated by Vehicle ECU • No valid ambient temperature received by Engine Control Module	• MIL illuminated	• Faulty instrument cluster/harness or cluster harness connectors
FMI 14	• Special instructions	• AAT sensor signal fault	• MIL illuminated	• AAT sensor signal missing from Vehicle ECU
FMI 19	• Received network data in error	• AAT sensor signal fault	• MIL illuminated	• Faulty instrument cluster

ECM SPN 173, Engine Exhaust Gas Temperature (EGT) – MID 128 PID 173

Type of fault:	**FMI Description:**	**Fault Condition:**	**Possible Symptoms:**	**Possible Cause:**
FMI 0	• Data valid but above normal operational range - Most severe level	• EGT is critically high	• Engine derate • Poor driveability • Aftertreatement regeneration is not possible	• Faulty harness • Faulty harness connector • Intake air leak
FMI 2	• Data erratic, intermittent or incorrect	• Sensor is not rational	• MIL illuminated • Aftertreatement regeneration is not possible	• Faulty harness • Faulty harness connector • Exhaust leak • Intake air leak • Sensor failure
FMI 4	• Voltage below normal, or shorted to low source	• Short to ground on the metering side of the circuit	• MIL illuminated • Aftertreatement regeneration is not possible	• Sensor failure • Faulty harness • Faulty harness connector • Aftertreatment control module (ACM)
FMI 5	• Current below normal or open circuit	• Short to battery on the metering side of the circuit • Open in the metering side of the circuit • Open in the ground side of the circuit	• MIL illuminated	• Faulty harness • Sensor failure • Faulty harness connector

FMI 15	• Data valid but above normal operating range - Least severe level	• Sensor out of range • Sensor indicates a invalid value	• MIL illuminated	• Sensor failure • Faulty harness
FMI 16	• Data valid but above normal operating range - Moderately severe level	• EGT is moderately too high	• Engine derate • Poor driveability	• Faulty harness • Faulty harness connector • Intake air leak

ECM SPN 175, Engine Oil Temperature (EOT) 1 – MID 128 PID 175

Type of fault:	**FMI Description:**	**Fault Condition:**	**Possible Symptoms:**	**Possible Cause:**
FMI 0	• Data valid but above normal operational range - Most severe level	• Extreme driving conditions • EOT critically above range	• Red Stop or yellow Check lamps illuminated dependent of severity • Engine derate	• Extreme driving conditions • Engine cooling fan • Oil thermostat • Coolant system • Clogged oil cooler
FMI 2	• Data erratic, intermittent or incorrect	• EOT sensor indicating too high or too low a value (abnormal value)	• MIL illuminated • In some cases may have an effect on driveability	• EOT sensor failure • Faulty harness
FMI 4	• Voltage below normal, or shorted to low source	• Short circuit -, measuring line	• MIL illuminated • Yellow Check lamp illuminated	• EOT sensor failure • Faulty harness
FMI 5	• Current below normal or open circuit	• Short circuit +, measuring line • Open circuit	• MIL illuminated • Yellow Check lamp illuminated	• EOT sensor failure • Faulty harness
FMI 13	• Out of Calibration	• Sensor out of range • Sensor indicates a invalid value	• MIL illuminated	• EOT sensor failure
FMI 16	• Data valid but above normal operating range - Moderately severe level	• Extreme driving conditions • EOT is moderately too high	• Yellow Check lamp illuminated • Engine derate	• Extreme driving conditions • Engine cooling fan • Oil thermostat • Coolant system • Clogged oil cooler
FMI 17	• Data valid but below normal operating range - Least severe level	• Sensor out of range • Sensor indicates a invalid value	• MIL illuminated	• Engine Oil Temperature (EOT) sensor failure

ECM SPN 177, Transmission Oil Temperature – MID 128 PID 177

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	• Data valid but above normal operational range - Most severe level	• Oil temperature critically above range	• Red Stop or yellow Check lamps illuminated dependent of severity	• Transmission oil cooler • Coolant system
FMI 16	• Data valid but above normal operating range - Moderately severe level	• Oil temperature is moderately too high	• Yellow Check lamp illuminated	• Extreme driving conditions • Engine cooling fan • Oil thermostat • Coolant system • Clogged oil cooler

ECM SPN 188, Engine Speed At Idle, Point 1 (Engine Configurations) – MID 128 PID 188

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	• Data valid but above normal operational range - Most severe level	• Engine idle speed above desired speed	• MIL illuminated • High engine oil consumption • High fuel consumption	• Engine oil entering cylinders • Leaking or faulty fuel injector
FMI 1	• Data valid but below normal operational range - Most severe level	• Engine idle speed below desired speed	• MIL illuminated • High fuel consumption	• Low engine torque production • Faulty fuel injector • Low cylinder compression • Engine friction is too high

ECM SPN 190, Engine Speed – MID 128 PID 190

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	• Data valid but above normal operational range - Most severe level	• Engine is/was overspeeding	• Red Stop lamp illuminated	• Engine oil entering cylinders • Faulty crankcase oil filter • Possible engine brake engaged causing engine overspeeding • Possible transmission downshift causing engine overspeeding

ECM SPN 228, Speed Sensor Calibration – MID 128 PID 228

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 9	• Abnormal update rate	• SAE J1587 data link calibration factor message does not exist. (vehicle ECU (VECU) error).	• Your trip data	• VECU
FMI 11	• Failure mode not identifiable	• SAE J1587 data link calibration factor message does not exist. (vehicle ECU (VECU) error).	• Your trip data	• VECU

ECM SPN 237, Vehicle Identification Number (VIN) – MID 128 PSID 161

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 2	• Data erratic, intermittent or incorrect	• No answer from VIN	• Yellow Check lamp illuminated • Engine will not start	• Data link error • Engine control module (ECM) • Missing VIN in other electronic control units (ECUs) commonly vehicle electronic control unit (VECU), light control module (LCM)
FMI 12	• Bad intelligent device or component	• Bad answer from VIN	• Yellow Check lamp illuminated • Engine will not start	• Engine control module (ECM) • Mismatched VIN sent from other electronic control units (ECUs) commonly vehicle electronic control unit (VECU), light control module (LCM))

ECM SPN 245, Total Vehicle Distance – MID 128 PID 245

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 9	• Abnormal update rate	• SAE J1587 data link total vehicle distance message does not exist. (vehicle ECU (VECU) error).	• N/A	• VECU

ECM SPN 251, Time – MID 128 PID 251

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 2	• Data erratic, intermittent or incorrect	• Time data message missing on SAE J1587 and J1939 data links. (Cluster error). • Time stamp from cluster isn't available.	• N/A	• Instrument Cluster
FMI 9	• Abnormal update rate	• Time data message didn't arrive when expected. (Cluster error). • Time stamp from cluster isn't available.	• N/A	• Instrument Cluster
FMI 10	• Abnormal rate of change	• Soak time too long. • Time data fault, data deemed inaccurate.	• MIL illuminated	• Instrument Cluster
FMI 12	• Bad intelligent device or component	• Time and date data missing on J1939 data link.	• MIL illuminated	• Instrument Cluster • Faulty harness • Faulty harness connector
FMI 13	• Out of calibration	• Time/date fault	• MIL illuminated	• Instrument Cluster • Faulty harness • Faulty harness connector
FMI 19	• Received network data in error	• Soaktime too long. • Time data fault, data deemed inaccurate.	• MIL illuminated	• Instrument Cluster

ECM SPN 252, Date – MID 128 PID 252

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 9	• Abnormal update rate	• Time stamp from cluster isn't available. • Date data message missing on SAE J1587 data link. (Cluster error).	• N/A	• Instrument Cluster

ECM SPN 411, Engine Exhaust Gas Recirculation (EGR) Differential Pressure – MID 128 PID 411

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	• Data valid but above normal operational range - Most severe level	• EGR differential pressure sensor output reading too high. (abnormal value)	• MIL illuminated • Engine derate	• Faulty harness • Faulty harness connector • Faulty sensor • EGR leakage • Clogged EGR cooler
FMI 2	• Data erratic, intermittent or incorrect	• Only used to control EGR valve.	• N/A	• N/A
FMI 3	• Voltage above normal or shorted to high source	• Short to battery in metering line • Open in the ground circuit	• MIL illuminated • Engine derate	• Faulty EGR differential pressure sensor connector • Faulty EGR differential pressure sensor harness • Faulty EGR differential pressure sensor
FMI 5	• Current below normal or open circuit	• Open in the 5 volt supply line • Short to ground in metering line • Open in the metering line	• MIL illuminated • Engine derate	• Faulty EGR differential pressure sensor connector • Faulty EGR differential pressure sensor harness • Faulty EGR differential pressure sensor
FMI 7	• Mechanical system not responding or out of adjustment	• EGR differential pressure sensor is read either to high or too low. (Abnormal value).	• MIL illuminated • Engine derate	• Faulty EGR differential pressure sensor connector • Faulty EGR differential pressure sensor harness • Faulty EGR differential pressure sensor • EGR valve • EGR valve leak • Clogged venturi

FMI 10	• Abnormal rate of change	• EGR differential pressure sensor out of range (too high)	• N/A	• Faulty EGR differential pressure sensor
FMI 14	• Special instructions	• EGR differential pressure sensor out of range (too low)	• N/A	• Faulty EGR differential pressure sensor
FMI 16	• Data valid but above normal operating range - Moderately severe level	• EGR differential pressure sensor out of range (too high)	• N/A	• Faulty EGR differential pressure sensor
FMI 18	• Data valid but below normal operating range - Moderately severe level	• EGR differential pressure sensor out of range (too low)	• N/A	• Faulty EGR differential pressure sensor

ECM SPN 412, Engine Exhaust Gas Recirculation (EGR) Temperature – MID 128 PID 412

Type of fault:	**FMI Description:**	**Fault Condition:**	**Possible Symptoms:**	**Possible Cause:**
FMI 0	• Data valid but above normal operational range - Most severe level	• Engine EGR Temperature is above range	• Engine derate	• Extreme driving conditions • EGR cooler failure
FMI 2	• Data erratic, intermittent or incorrect	• EGR temperate signal, believed to be not valid (plausibility fault)	• MIL illuminated • Engine derate	• Faulty sensor
FMI 4	• Voltage below normal, or shorted to low source	• Short to ground on the metering side of the EGR Sensor circuit	• MIL illuminated • Engine power will be derated according to the error torque map	• Faulty EGR temperature sensor connector • Faulty EGR temperature sensor harness • Faulty EGR temperature sensor
FMI 5	• Current below normal or open circuit	• Short to battery in the metering side of the EGR Sensor circuit • Open in the metering side of the EGR Sensor circuit • Open circuit in the ground line of the EGR Sensor circuit	• MIL illuminated • Engine derate	• Faulty EGR temperature sensor connector • Faulty EGR temperature sensor harness • Faulty EGR temperature sensor

FMI 13	• Out of calibration	• Engine EGR temperature sensor is out of range (low) • Sensor indicates a invalid value	• MIL illuminated	• Faulty EGR temperature sensor connector • Faulty EGR temperature sensor harness • Faulty EGR temperature sensor
FMI 13	• Out of calibration	• Engine EGR temperature sensor is above range	• Engine derate	• Extreme driving conditions • EGR cooler failure
FMI 15	• Data valid but above normal operating range - Least severe level	• Engine EGR temperature sensor is out of range (high) • Sensor indicates a invalid value	• MIL illuminated	• Faulty EGR temperature sensor connector • Faulty EGR temperature sensor harness • Faulty EGR temperature sensor
FMI 16	• Data valid but above normal operating range - Moderately severe level	• Engine EGR temperature is above range	• Engine derate	• Extreme driving conditions • EGR cooler failure
FMI 17	• Data valid but below normal operating range - Least severe level	• Engine EGR temperature is out of range (low) • Sensor indicates a invalid value	• MIL illuminated	• Faulty EGR temperature sensor connector • Faulty EGR temperature sensor harness • Faulty EGR temperature sensor

ECM SPN 558, Accelerator Pedal 1 Idle Validation Switch (IVS) – MID 128 SID 230

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	• Voltage above normal, or shorted to high source	• IVS signal shorted to voltage	• Yellow Check lamp illuminated	• Faulty harness or connector
FMI 5	• Current below normal or open circuit	• IVS signal shorted to ground or open	• Yellow Check lamp illuminated	• Faulty harness or connector

ECM SPN 626, Intake Air Heater (IAH) Relay – MID 128 PID 45

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	• Voltage above normal, or shorted to high source	• Short Circuit +, Measuring line	• IAH relay not activated • White smoke for cold start • Start problems in cold climate	• IAH relay solenoid shorted

FMI 4	• Voltage below normal, or shorted to low source	• Short Circuit -, Measuring line	• Yellow Check lamp illuminated • Induction air is hot • IAH relay is impossible to turn off	• Faulty harness
FMI 5	• Current below normal or open circuit	• Open Circuit	• Preheat relay not activated • White smoke for cold start • Start problems in cold climate	• Faulty IAH relay • Faulty harness

ECM SPN 628, Program Memory – MID 128 SID 240

Type of fault:	**FMI Description:**	**Fault Condition:**	**Possible Symptoms:**	**Possible Cause:**
FMI 2	• Data erratic, intermittent or incorrect	• Check sum error	• Red Stop lamp illuminated • Engine will not start	• Engine Control Module (ECM) software
FMI 11	• Root cause not known	• Bad software configuration	• MIL illuminated • Engine will not start	• Engine Control Module (ECM) software
FMI 12	• Bad intelligent device or component	• Error on code-part of flash RAM or erased vendor area	• Red Stop lamp illuminated • Nothing functions	• Engine Control Module (ECM) software • Engine Control Module (ECM)
FMI 14	• Special instructions	• VIN not loaded yet	• Flashing MIL • Engine will not start	• Vehicle identification number (VIN) missing

ECM SPN 629, Electronic Control Unit (ECU) 1 – MID 128 SID 254

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 8	• Abnormal frequency or pulse width or period	• Self test failure	• Red Stop lamp illuminated • Not possible to program Engine Control Module (ECM)	• ECM
FMI 12	• Bad intelligent device or component	• Self test failure	• Red Stop lamp illuminated • Engine will not start	• ECM

ECM SPN 630, Calibration Memory – MID 128 SID 253

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 2	• Data erratic, intermittent or incorrect	• Check sum error	• Red Stop lamp illuminated • Engine will not start	• Engine Control Module (ECM) software
FMI 12	• Bad intelligent device or component	• Check sum error	• Red Stop lamp illuminated • Engine will not start	• Engine Control Module (ECM)
FMI 14	• Special instructions	• Vehicle identification number (VIN) not loaded yet	• Loss of log data and some user configurable data	• Engine Control Module (ECM) software

ECM SPN 631, Calibration Module – MID 128 PSID 77/PSID 124

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	• Voltage above normal, or shorted to high source	• Check sum error	• Engine will not start	• Aftertreatment control module (ACM) software error
FMI 8	• Abnormal frequency or pulse width or period	• Reset of ECM does not work	• Engine will not start	• Aftertreatment control module (ACM) software error

ECM SPN 633, Engine Fuel Actuator 1 Control Command – MID 128 SID 18

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	• Voltage above normal, or shorted to high source	• Circuit shorted +	• Yellow Check lamp illuminated • Valve constantly shut	• Faulty solenoid • Faulty harness • Faulty engine control module (ECM) driver
FMI 4	• Voltage below normal, or shorted to low source	• Circuit shorted –	• Yellow Check lamp illuminated • High fuel consumption due to fuel leakage	• Faulty solenoid • Faulty harness • Faulty engine control module (ECM) driver
FMI 5	• Current below normal or open circuit	• Open circuit	• Yellow Check lamp illuminated • Valve constantly shut	• Faulty solenoid • Faulty harness

ECM SPN 636, Camshaft Position (CMP) Sensor – MID 128 SID 21

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 2	• Data erratic, intermittent or incorrect	• Phase Error - Incorrect correlation between CMP and crankshaft position (CKP) sensor	• MIL illuminated • Increase in fuel consumption	• Engine timing

FMI 3	• Voltage above normal, or shorted to high source	• Missing Signal from CMP sensor • Open in the CMP sensor circuit • Short to battery in the CMP sensor circuit • Short to ground in the CMP sensor circuit	• MIL illuminated • Possible loss of engine power • Increased engine start time	• Faulty harness
FMI 8	• Abnormal frequency or pulse width or period	• Noisy Signal from CMP sensor • Open in the CMP sensor circuit	• MIL illuminated • Possible loss of engine power • Increased engine start time	• Faulty CMP sensor • Faulty harness

ECM SPN 637, Crankshaft Position (CKP) Sensor – MID 128 SID 22

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 2	• Data erratic, intermittent or incorrect	• Intermittent or weak signal	• MIL illuminated • Yellow Check lamp illuminated • Increased fuel consumption • Imprecise engine timing • Increased fuel consumption • Uneven cylinder balancing • Power loss • Smoke	• Faulty CKP sensor harness • Faulty CKP sensor
FMI 3	• Voltage above normal, or shorted to high source	• Missing signal CKP sensor • Open in the CKP sensor circuit • Short to battery in the CKP sensor circuit • Short to ground in the CKP sensor circuit	• MIL illuminated • Yellow Check lamp illuminated • Possible loss of engine power • Increased fuel consumption	• Faulty CKP sensor harness • Faulty CKP sensor
FMI 8	• Abnormal frequency or pulse width or period	• Erratic or intermittent signal from CKP sensor • Open in the CKP sensor	• MIL illuminated • Yellow Check lamp illuminated • Possible loss of engine power • Increased engine start time • Increased fuel consumption • Uneven cylinder balancing • Power loss • Smoke	• Faulty CKP sensor harness • Faulty CKP sensor mounting

ECM SPN 639, SAE J1939 Data Link 1 – MID 128 SID 231

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 2	• Data erratic, intermittent or incorrect	• SAE J1939 high or low circuit shorted + • SAE J1939 high or low circuit shorted – • SAE J1939 high or low circuit open	• MIL illuminated	• Faulty harness or connector

ECM SPN 641, Engine Variable Geometry Turbocharger (VGT) Actuator 1 – MID 128 SID 27

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	• Data valid but above normal operational range - Most severe level	• Engine VGT actuator temperature out of range	• Yellow Check lamp illuminated • Possible engine derate	• N/A
FMI 2	• Data erratic, intermittent or incorrect	• Engine VGT actuator has not seen a valid command on SAE J1939 (CAN2) data link • Incorrect data	• MIL illuminated • Yellow Check lamp illuminated • Low boost • Low power • Nozzle opens • Smoke from engine	• Disturbance on SAE J1939 (CAN2) data link
FMI 4	• Voltage below normal, or shorted to low source	• Short to ground	• MIL illuminated • Yellow Check lamp illuminated • Nozzle will open resulting in low power and low boost • Engine VGT actuator will continue to attempt and maintain target nozzle position	• Faulty engine VGT actuator connector • Faulty engine VGT actuator harness • Low battery voltage

FMI 7	• Mechanical system not responding or out of adjustment	• Mechanical problem with the engine VGT actuator	• MIL illuminated • Yellow Check lamp illuminated • Low boost and smoke • Possible engine derate • Power loss in some cases when actuator motor has been disabled	• Engine VGT actuator motor effort is temporarily limited to prevent overheating • Restrictions detected when running learn sequence • Engine VGT actuator is slow to follow commands • Engine VGT actuator position is not tracking command
FMI 9	• Abnormal update rate	• Data from the engine VGT actuator has been missing for 2-seconds	• MIL illuminated • Yellow Check lamp illuminated • Engine derated (major) • EGR valve closed	• Data link harness • No supply to engine VGT actuator • Engine VGT actuator • Engine VGT actuator connector
FMI 12	• Bad intelligent device or component	• Engine VGT disabled by internal diagnostics	• MIL illuminated • Yellow Check lamp illuminated • Nozzle will open resulting in low power, low boost and smoke	• Loss of communication • Internal diagnostic failures • Data storage failure • Over rotation • Engine VGT actuator • Engine VGT actuator connector
FMI 13	• Out of calibration	• Failed self-calibration	• Yellow Check lamp illuminated	• VGT actuator

ECM SPN 642, Engine Variable Geometry Turbocharger (VGT) Actuator 2 – MID 128 PPID 89

Type of fault	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause
FMI 0	• Data valid but above normal operational range - Most severe level	• VGT actuator temperature is critically high	• Red Stop or yellow Check lamps illuminated dependent of severity • Engine derate	• Coolant system malfunction • Extreme driving conditions • Overheated engine VGT actuator
FMI 16	• Data valid but above normal operating range - Moderately severe level	• VGT actuator temperature is moderately too high	• Yellow Check lamp illuminated • Engine derate	• Coolant system malfunction • Extreme driving conditions • Overheated engine VGT actuator

ECM SPN 647, Engine Fan Clutch Output Device Driver – MID 128 SID 33

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	• Voltage above normal, or shorted to high source	• Short to positive in the cooling fan control circuit	• Yellow Check lamp illuminated • Increased fuel consumption • Fan runs at full speed	• Faulty cooling fan actuator • Faulty cooling fan actuator harness or connector
FMI 4	• Voltage below normal, or shorted to low source	• Short to ground in the cooling fan control circuit • Output voltage is 1/3 the supply voltage	• Yellow Check lamp illuminated • Fan always deactivated or always activated if fault is intermittent	• Faulty cooling fan actuator • Faulty cooling fan actuator harness or connector
FMI 5	• Current below normal or open circuit	• Open in the cooling fan control circuit	• Increased fuel consumption • Fan runs at full speed	• Faulty cooling fan actuator • Faulty cooling fan actuator harness or connector

ECM SPN 651, Engine Injector Cylinder 1 – MID 128 SID 1

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	• Voltage above normal, or shorted to high source	• Harness shorted + low side circuit	• MIL illuminated • Yellow Check lamp illuminated • Engine power loss • Engine running uneven (misfire)	• Faulty harness
FMI 5	• Current below normal or open circuit	• Harness shorted +, – or open high side circuit • Harness shorted – low side circuit	• MIL illuminated • Yellow Check lamp illuminated • Engine power loss • Engine running uneven (misfire)	• Faulty harness • Faulty engine injector

FMI 7	• Mechanical system not responding properly	• Cylinder balancing data above limit	• MIL illuminated	• PTO engaged without engine control module (ECM) knowing • Faulty engine injector • Low cylinder compression • Damaged or flywheel
FMI 13	• Out of calibration	• Cylinder balancing data above limit	• MIL illuminated	• PTO engaged without ECM knowing • Faulty engine fuel injector • Low cylinder compression • Damaged or flywheel

ECM SPN 652, Engine Injector Cylinder 2 – MID 128 SID 2

Type of fault:	**FMI Description:**	**Fault Condition:**	**Possible Symptoms:**	**Possible Cause:**
FMI 3	• Voltage above normal, or shorted to high source	• Harness shorted + low side circuit	• MIL illuminated • Yellow Check lamp illuminated • Engine power loss • Engine running uneven (misfire)	• Faulty harness
FMI 5	• Current below normal or open circuit	• Harness shorted +, – or open high side circuit • Harness shorted – low side circuit	• MIL illuminated • Yellow Check lamp illuminated • Engine power loss • Engine running uneven (misfire)	• Faulty harness • Faulty engine injector
FMI 7	• Mechanical system not responding properly	• Cylinder balancing data above limit	• MIL illuminated	• PTO engaged without engine control module (ECM) knowing • Faulty engine injector • Low cylinder compression • Damaged or flywheel
FMI 13	• Out of calibration	• Cylinder balancing data above limit	• MIL illuminated	• PTO engaged without engine control module (ECM) knowing • Faulty engine fuel injector • Low cylinder compression • Damaged or flywheel

ECM SPN 653, Engine Injector Cylinder 3 – MID 128 SID 3

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	• Voltage above normal, or shorted to high source	• Harness shorted + low side circuit	• MIL illuminated • Yellow Check lamp illuminated • Engine power loss • Engine running uneven (misfire)	• Faulty harness
FMI 5	• Current below normal or open circuit	• Harness shorted +, – or open high side circuit • Harness shorted – low side circuit	• MIL illuminated • Yellow Check lamp illuminated • Engine power loss • Engine running uneven (misfire)	• Faulty harness • Faulty engine injector
FMI 7	• Mechanical system not responding properly	• Cylinder balancing data above limit	• MIL illuminated	• PTO engaged without engine control module ECM knowing • Faulty engine fuel injector • Low cylinder compression • Damaged or flywheel
FMI 13	• Out of calibration	• Cylinder balancing data above limit	• MIL illuminated	• PTO engaged without engine control module ECM knowing • Faulty engine injector • Low cylinder compression • Damaged or flywheel

ECM SPN 654, Engine Injector Cylinder 4 – MID 128 SID 4

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	• Voltage above normal, or shorted to high source	• Harness shorted + low side circuit	• MIL illuminated • Yellow Check lamp illuminated • Engine power loss • Engine running uneven (misfire)	• Faulty harness
FMI 5	• Current below normal or open circuit	• Harness shorted +, – or open high side circuit • Harness shorted – low side circuit	• MIL illuminated • Yellow Check lamp illuminated • Engine power loss • Engine running uneven (misfire)	• Faulty harness • Faulty engine injector

FMI 7	• Mechanical system not responding properly	• Cylinder balancing data above limit	• MIL illuminated	• PTO engaged without engine control module (ECM) knowing • Faulty engine injector • Low cylinder compression • Damaged or flywheel
FMI 13	• Out of calibration	• Cylinder balancing data above limit	• MIL illuminated	• PTO engaged without engine control module (ECM) knowing • Faulty engine fuel injector • Low cylinder compression • Damaged or flywheel

ECM SPN 655, Engine Injector Cylinder 5 – MID 128 SID 5

Type of fault:	**FMI Description:**	**Fault Condition:**	**Possible Symptoms:**	**Possible Cause:**
FMI 3	• Voltage above normal, or shorted to high source	• Harness shorted + low side circuit	• MIL illuminated • Yellow Check lamp illuminated • Engine power loss • Engine running uneven (misfire)	• Faulty harness
FMI 5	• Current below normal or open circuit	• Harness shorted +, – or open high side circuit • Harness shorted – low side circuit	• MIL illuminated • Yellow Check lamp illuminated • Engine power loss • Engine running uneven (misfire)	• Faulty harness • Faulty engine injector
FMI 7	• Mechanical system not responding properly	• Cylinder balancing data above limit	• MIL illuminated	• PTO engaged without engine control module (ECM) knowing • Faulty engine fuel injector • Low cylinder compression • Damaged or flywheel
FMI 13	• Out of calibration	• Cylinder balancing data above limit	• MIL illuminated	• PTO engaged without engine control module (ECM) knowing • Faulty engine injector • Low cylinder compression • Damaged or flywheel

ECM SPN 656, Engine Injector Cylinder 6 – MID 128 SID 6

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	• Voltage above normal, or shorted to high source	• Harness shorted + low side circuit	• MIL illuminated • Yellow Check lamp illuminated • Engine power loss • Engine running uneven (misfire)	• Faulty harness
FMI 5	• Current below normal or open circuit	• Harness shorted +, – or open high side circuit • Harness shorted – low side circuit	• MIL illuminated • Yellow Check lamp illuminated • Engine power loss • Engine running uneven (misfire)	• Faulty harness • Faulty engine injector
FMI 7	• Mechanical system not responding properly	• Cylinder balancing data above limit	• MIL illuminated	• PTO engaged without engine control module (ECM) knowing • Faulty engine fuel injector • Low cylinder compression • Damaged or flywheel
FMI 13	• Out of calibration	• Cylinder balancing data above limit	• MIL illuminated	• PTO engaged without engine control module (ECM) knowing • Faulty engine injector • Low cylinder compression • Damaged or flywheel

ECM SPN 677, Engine Starter Motor Relay – MID 128 SID 39

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	• Voltage above normal, or shorted to high source	• Circuit shorted +	• Yellow Check lamp illuminated • Engine will not start	• Faulty starter relay • Fault harness
FMI 5	• Current below normal or open circuit	• Open circuit	• Yellow Check lamp illuminated • Engine will not start	• Faulty starter relay • Fault harness

ECM SPN 729, Intake Air Heater (IAH) 1 – MID 128 SID 70

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	• Voltage above normal, or shorted to high source	• Circuit shorted +, measuring line	• Yellow Check lamp illuminated	• Faulty IAH relay • Faulty IAH 1
FMI 4	• Voltage below normal, or shorted to low source	• Circuit shorted –, measuring line	• Yellow Check lamp illuminated	• Faulty IAH relay • Faulty IAH 1
FMI 5	• Current below normal or open circuit	• Open circuit	• Yellow Check lamp illuminated	• Faulty IAH 1

ECM SPN 730, Intake Air Heater (IAH) 2 – MID 128 SID 71

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	• Voltage above normal, or shorted to high source	• Circuit shorted +, measuring line	• Yellow Check lamp illuminated	• Faulty IAH relay • Faulty IAH 2
FMI 4	• Voltage below normal, or shorted to low source	• Circuit shorted –, measuring line	• Yellow Check lamp illuminated	• Faulty IAH relay • Faulty IAH 2
FMI 5	• Current below normal or open circuit	• Open circuit	• Yellow Check lamp illuminated	• Faulty IAH 2

ECM SPN 931, Engine Fuel Supply Pump Actuator – MID 128 SID 78

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	• Voltage above normal, or shorted to high source	• Fuel priming pump circuit shorted +	• Fuel priming or drain aborted and inhibited	• Faulty actuator • Faulty harness
FMI 4	• Voltage below normal, or shorted to low source	• Fuel priming pump circuit shorted –,	• Fuel priming pump permanently on	• Faulty actuator • Faulty harness
FMI 5	• Current below normal or open circuit	• Open circuit fuel priming pump	• Fuel priming or drain inhibited	• Faulty actuator • Faulty harness

ECM SPN 970, Engine Auxiliary Shutdown Switch – MID 128 PPID 6

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	• Voltage above normal, or shorted to high source	• Engine shutdown switch circuit shorted +	• Engine shutdown switch can not be activated	• Engine shutdown switch
FMI 5	• Current below normal or open circuit	• Open circuit in engine shutdown switch	• Engine shutdown switch can not be activated	• Engine shutdown switch

ECM SPN 975, Estimated Percent Fan Speed – (MID 128 PID 26)

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	• Voltage above normal, or shorted to high source	• Missing signal from Fan Speed Sensor • Short Circuit +, Measuring line • Short Circuit -, Measuring line • Open Circuit, Measuring line • Open Circuit, Ground line	• Higher fuel consumption • Will work as on/off fan, 100%fan speed if cooling is needed	• Cooling Fan Speed (CFS) sensor failure • Faulty Cooling Fan Speed (CFS) sensor harness

ECM SPN 1072, Engine Compression Brake Output #1 – MID 128 PPID 122

Type of fault	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause
FMI 1	• Data valid but below normal operational range - Most severe level	• Below range	• Info lamp illuminated • No engine compression brake	• Low engine oil temperature
FMI 3	• Voltage above normal, or shorted to high source	• Short Circuit +	• Yellow Check lamp illuminated • Engine compression brake can not be turned on • Engine brake function derated • Gear shift performance derated for some automatic transmissions	• Faulty engine compression brake actuator • Faulty harness
FMI 4	• Voltage below normal, or shorted to low source	• Short Circuit -	• Yellow Check lamp illuminated • Engine compression brake can not be turned off • Engine stops running • Engine impossible to restart	• Faulty engine compression brake actuator • Faulty harness
FMI 5	• Current below normal or open circuit	• Open Circuit	• Yellow Check lamp illuminated • Engine compression brake can not be turned on • Engine brake function derated • Gear shift performance derated for some automatic transmission boxes	• Faulty engine compression brake actuator • Faulty harness

ECM SPN 1127, Engine Turbocharger Intake Manifold Pressure (IMP) – MID 128 PSID 98

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	• Data valid but above normal operational range	• Engine turbocharger boost pressure is too high	• MIL illuminated • Turbocharger surge	• Exhaust gas recirculation (EGR) system failure • Faulty engine turbocharger oulet pressure sensor
FMI 1	• Data valid but below normal operational range	• Engine turbocharger boost pressure is too low	• MIL illuminated • Engine derate • Engine slow to respond	• Air leak in turbocharger hoses, pipes, brackets, cooler or components • EGR system fault
FMI 10	• Abnormal rate of change	• Poor engine turbocharger boost pressure response	• MIL illuminated • Engine power loss/re-sponse/drivability	• Engine turbocharger inlet air system leak • Faulty engine turbocharger
FMI 11	• Root cause not known	• Engine variable geometry turbocharger (VGT) control mode fault	• MIL illuminated	• Engine VGT fault
FMI 14	• Special instructions	• Poor engine turbocharger boost pressure response	• MIL illuminated	• Air leak in engine turbocharger hoses, pipes, brackets, cooler or components • Engine variable geometry turbocharger (VGT) fault • Oil pressure fault
FMI 16	• Data valid but above normal operating range - Moderately severe level	• Engine turbocharger boost pressure is too high	• MIL illuminated • Engine turbocharger surge	• Exhaust gas recirculation (EGR) system failure • Faulty sensor
FMI 18	• Data valid but below normal operating range - Moderately severe level	• Engine turbocharger boost pressure is too low	• MIL illuminated • Engine derate • Engine slow to respond	• Air leak in engine turbocharger hoses, pipes, brackets, cooler or components • Exhaust gas recirculation (EGR) system failure

ECM SPN 1136, Engine Control Module (ECM) Temperature – MID 128 PPID 55

Type of fault	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause
FMI 4	• Voltage below normal, or shorted to low source	• Short to ground on the metering circuit	• N/A	• ECM

FMI 5	• Current below normal or open circuit	• Short to battery in the metering circuit • Open in the metering circuit • Open circuit in the ground circuit	• N/A	• ECM

ECM SPN 1198, Anti–theft Random Number – MID 128 PID 224

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 2	• Data erratic, intermittent or incorrect	• Engine control module (ECM) and instrument cluster control module security codes do not match	• Yellow Check lamp illuminated • Can start engine	• Security system failure
FMI 12	• Bad intelligent device or component	• Security system not installed	• Yellow Check lamp illuminated • Can start engine	• Security system failure

ECM SPN 1231, SAE J1939 Data Link 2 – MID 128 PSID 229

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 2	• Data erratic, intermittent or incorrect	• Circuit shorted + • Circuit shorted – • Open circuit	• MIL illuminated • Engine power loss • No Aftertreatment Diesel Exhaust Fluid (DEF) dosing • No engine variable geometry engine turbocharger (VGT) control	• Faulty harness
FMI 9	• Abnormal update rate	• Missing signal from transmission control module (TCM)	• MIL illuminated • Yellow Check lamp illuminated • No Aftertreatment Diesel Exhaust Fluid (DEF) dosing	• SAE J1939 data link • Faulty harness or connectors • DEF pump • DEF control module

ECM SPN 1265, Engine Piston Cooling Oil Pressure Actuator – MID 128 SID 85

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	• Voltage above normal, or shorted to high source	• Circuit shorted +	• Yellow Check lamp illuminated • Possible smoke during start up	• Faulty harness • Faulty actuator
FMI 4	• Voltage below normal, or shorted to low source	• Circuit shorted –	• Red Stop lamp illuminated • Engine damage can occur without piston cooling	• Faulty harness • Faulty actuator
FMI 5	• Current below normal or open circuit	• Open circuit	• Yellow Check lamp illuminated • Possible smoke during start up	• Faulty harness • Faulty actuator

ECM SPN 1322, Engine Misfire for Multiple Cylinders – MID 128 PSID 27

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 8	• Abnormal frequency or pulse width or period	• Cylinder misfires detected in multiple cylinders	• MIL illuminated • Rough idle	• Engine injectors
FMI 31	• Condition exists	• Cylinder misfires detected in multiple cylinders	• MIL illuminated • Rough idle	• Engine injectors

ECM SPN 1323, Engine Misfire Cylinder #1 – MID 128 SID 1

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 8	• Abnormal frequency or pulse width or period	• Cylinder misfires detected in cylinder 1	• MIL illuminated • Rough idle	• Engine injector
FMI 31	• Condition exists	• Cylinder misfires detected in cylinder1	• MIL illuminated • Rough idle	• Engine injector

ECM SPN 1324, Engine Misfire Cylinder #2 – MID 128 SID 2

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 8	• Abnormal frequency or pulse width or period	• Cylinder misfires detected in cylinder 2	• MIL illuminated • Rough idle	• Engine injector
FMI 31	• Condition exists	• Cylinder misfires detected in cylinder 2	• MIL illuminated • Rough idle	• Engine injector

ECM SPN 1325, Engine Misfire Cylinder #3 – MID 128 SID 3

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 8	• Abnormal frequency or pulse width or period	• Cylinder misfires detected in cylinder 3	• MIL illuminated • Rough idle	• Engine injector
FMI 31	• Condition exists	• Cylinder misfires detected in cylinder 3	• MIL illuminated • Rough idle	• Engine injector

ECM SPN 1326, Engine Misfire Cylinder #4 – MID 128 SID 4

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 8	• Abnormal frequency or pulse width or period	• Cylinder misfires detected in cylinder 4	• MIL illuminated • Rough idle	• Engine injector
FMI 31	• Condition exists	• Cylinder misfires detected in cylinder 4	• MIL illuminated • Rough idle	• Engine injector

ECM SPN 1327, Engine Misfire Cylinder #5 – MID 128 SID 5

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 8	• Abnormal frequency or pulse width or period	• Cylinder misfires detected in cylinder 5	• MIL illuminated • Rough idle	• Engine injector
FMI 31	• Condition exists	• Cylinder misfires detected in cylinder 5	• MIL illuminated • Rough idle	• Engine injector

ECM SPN 1328, Engine Misfire Cylinder #6 – MID 128 SID 6

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 8	• Abnormal frequency or pulse width or period	• Cylinder misfires detected in cylinder 6	• MIL illuminated • Rough idle	• Engine injector
FMI 31	• Condition exists	• Cylinder misfires detected in cylinder 6	• MIL illuminated • Rough idle	• Engine injector

ECM SPN 1659, Engine Coolant System Thermostat – MID 128 PSID 109

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 7	• Mechanical system not responding or out of adjustment	• Thermostat stuck closed	• Possible poor drivability	• Coolant thermostat
FMI 12	• Bad intelligent device or component	• Thermostat is leaking or stuck open	• MIL illuminated • Longer engine warm up time • Poor heat in cab	• Coolant thermostat

ECM SPN 1675, Engine Starter Mode – MID 128 SID 39

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	• Data valid but above normal operational range - Most severe level	• Starter overheating	• Engine will not start	• Starter is deactivated due to overheating
FMI 7	• Mechanical system not responding or out of adjustment	• Transmission not in neutral	• Engine will not start	• Starter is deactivated due to overheating
FMI 10	• Abnormal rate of change	• Starter gear is stuck, engaged with engine	• Engine will not start	• Starter is deactivated due to overheating
FMI 14	• Special instructions	• PTO is engaged or switch on	• Engine will not start	• Starter is deactivated due to overheating

ECM SPN 1677, Aftertreatment Diesel Particulate Filter (DPF) Auxiliary Heater Mode – MID 128 PSID 25

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	• Data valid but above normal operational range — most severe level	• Truck has idled too long without completing a periodic heat mode	• Red Stop lamp illuminated • Engine derate • High temperature spikes in DPF when driving is resumed or during stationary regeneration	• Extremely cold ambient temperatures • PTO operated with limited exhaust temperatures • Engine turbocharger • Engine turbocharger compressor bypass valve
FMI 7	• Mechanical system not responding or out of adjustment	• Truck has idled too long without completing a periodic heat mode	• Yellow Check lamp illuminated • White exhaust smoke • High temperature spikes in DPF when driving is resumed or during stationary regeneration	• Extremely cold ambient temperatures • PTO operated with limited exhaust temperatures • Engine turbocharger • Engine turbocharger compressor bypass valve
FMI 16	• Data valid but above normal operating range - Moderately severe level	• Truck has idled too long without completing a periodic heat mode	• Yellow Check lamp illuminated • White exhaust smoke • High temperature spikes in DPF when driving is resumed or during stationary regeneration	• Extremely cold ambient temperatures • PTO operated with limited exhaust temperatures • Engine turbocharger • Engine turbocharger compressor bypass valve

ECM SPN 1761, Aftertreatment Diesel Exhaust Fluid (DEF) Tank Level – PPID 278

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	• Voltage above normal, or shorted to high source	• Short circuit high side	• N/A	• Aftertreatment DEF tank pickup assembly/sensor failure
FMI 5	• Current below normal or open circuit	• Short circuit + • Open circuit	• Yellow Check lamp illuminated	• Aftertreatment DEF tank pickup assembly/sensor failure
FMI 11	• Root cause not known	• Aftertreatment DEF tank level low (driver warning)	• Low aftertreatment DEF fluid lamp illuminated	• N/A

FMI 14	• Special Instructions	• Aftertreatment DEF tank almost empty (driver warning)	• Low aftertreatment DEF fluid lamp illuminated • No Aftertreatment DEF dosing	• N/A
FMI 18	• Data valid but below normal operating range - Moderately severe level	• Aftertreatment DEF tank almost empty (driver warning)	• Low aftertreatment DEF fluid lamp illuminated • No aftertreatment DEF dosing	• N/A

ECM SPN 2017, Cruise Control Status – MID 128 PID 85

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 9	• Abnormal update rate	• Missing cruise control signal from vehicle electronic control unit (VECU)	• Cruise control does not work	• No clutch information to engine control module (ECM) from SAE J1939 data link

ECM SPN 2023, Invalid or Missing Data From Instrument Cluster – MID 128 PSID 202

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 8	• Abnormal frequency or pulse width or period	• Missing signal from instrument cluster via SAE J1939 (CAN 1) data link (CM1 signal)	• Yellow Check lamp illuminated	• Faulty harness or connections

ECM SPN 2029, Invalid or Missing Data from Vehicle ECU – MID 128 PSID 201

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 9	• Abnormal update rate	• Missing signal from cluster	• MIL illuminated	• Faulty harness

ECM SPN 2629, Engine Turbocharger Compressor Outlet Temperature – MID 128 PID 404

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	• Data valid but above normal operational range - Most severe level	• Estimated engine turbocharger discharge temperature error.	• Engine derate	• High ambient air temperature (AAT) • Low barometric pressure • Leak in engine turbocharger inlet tube
FMI 2	• Data erratic, intermittent or incorrect	• Engine turbocharger outlet temperature signal believed to be not valid (high) (plausibility fault)	• Engine derate • MIL illuminated	• Engine turbocharger outlet temperature sensor
FMI 4	• Voltage below normal, or shorted to low source	• Short circuit –, measuring line	• MIL illuminated • Yellow Check lamp illuminated	• Engine turbocharger outlet temperature sensor • Faulty harness
FMI 5	• Current below normal or open circuit	• Short circuit +, measuring line • Open circuit	• MIL illuminated • Yellow Check lamp illuminated	• Engine turbocharger outlet temperature sensor • Faulty harness
FMI 13	• Out of calibration	• Sensor out of range	• MIL illuminated	• Engine turbocharger outlet temperature sensor
FMI 15	• Data valid but above normal operating range - Least severe level	• Sensor out of range	• MIL illuminated	• Engine turbocharger outlet temperature sensor
FMI 17	• Data valid but below normal operating range - Least severe level	• Sensor out of range	• MIL illuminated	• Faulty Engine turbocharger outlet temperature sensor

ECM SPN 2659, Engine Exhaust Gas Recirculation (EGR) Mass Flow Rate – MID 128 PPID 35

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0 (J1587 only)	• Data valid but above normal operational range	• EGR flow is too high	• MIL illuminated • Exhaust smoke	• Faulty EGR system
FMI 1	• Data valid but below normal operational range	• EGR flow is too low	• MIL illuminated	• Faulty EGR system • Clogged EGR cooler

FMI 16	• Data valid but above normal operating range - Moderately severe level	• EGR flow is too high	• MIL illuminated • Exhaust smoke	• Faulty EGR system • Faulty harness or connector
FMI 18	• Data valid but below normal operating range - Moderately severe level	• EGR flow is too low	• MIL illuminated	• Faulty EGR system • Clogged EGR cooler • Faulty harness or connector

ECM SPN 2791, Engine Exhaust Gas Recirculation (EGR) Valve Control – MID 128 SID 146

Type of fault:	**FMI Description:**	**Fault Condition:**	**Possible Symptoms:**	**Possible Cause:**
FMI 3	• Voltage above normal, or shorted to high source	• Stuck EGR valve • EGR valve circuit shorted + • EGR valve circuit shorted to –	• MIL illuminated • Engine derate	• Faulty harness or connector • Faulty EGR valve
FMI 5	• Current below normal or open circuit	• Open EGR valve circuit	• MIL illuminated • Engine derate	• Faulty harness or connector • Faulty EGR valve

ECM SPN 3031, Aftertreatment Diesel Exhaust Fluid (DEF) Tank Temperature – MID 128 PPID 274

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	• Data valid but above normal operational range - Most severe level	• Aftertreatment DEF tank temperature too high • Date data message missing on SAE J1587 data link. (cluster error).	• MIL illuminated • No Aftertreatment DEF dosing	• Aftertreatment DEF tank pickup assembly/sensor failure
FMI 4	• Voltage below normal, or shorted to low source	• Short Circuit -	• MIL illuminated	• Aftertreatment DEF tank pickup assembly/sensor failure • Aftertreatment DEF tank pickup asssembly/sensor wiring or connectors
FMI 5	• Current below normal or open circuit	• Short Circuit + • Open Circuit	• MIL illuminated	• Aftertreatment DEF tank pickup assembly/sensor failure • Aftertreatment DEF tank pickup assembly/sensor wiring or connectors
FMI 8	• Abnormal frequency or pulse width or period	• Sensor ripple is not too high	• N/A	• Aftertreatment DEF tank pickup assembly/sensor failure • Aftertreatment DEF tank pickup ‘assembly/sensor wiring or connectors

ECM SPN 3064, Aftertreatment Diesel Particulate Filter (DPF) System Monitor – MID 128 PPID 326

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	• Data valid but above normal operational range - Most severe level	• Moderately high soot load	• Yellow Check lamp illuminated • Medium to high engine derate	• Aftertreatment DPF clogged • Aftertreatment hydrocarbon doser clogged • Aftertreatment regeneration disabled by driver or other component
FMI 10	• Abnormal rate of change	• Soot loading high due to heavy load or use (no problem)	• Yellow Check lamp illuminated • Engine derate	• No error, condition occurs during heavy load or use with high soot loading
FMI 11	• Root cause not known	• Critically high soot load	• Red Stop lamp illuminated • High engine derate • Engine derate	• Aftertreatment DPF clogged • Aftertreatment hydrocarbon doser • Aftertreatment regeneration disabled by driver or other component

ECM SPN 3216, Aftertreatment Intake NOx – MID 128 PPID 348

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 2	• Data erratic, intermittent or incorrect	• Aftertreatment intake NOx sensor error (plausibility) • Mismatch between aftertreatment intake NOx sensor and aftertreatment outlet NOx sensor	• MIL illuminated	• Engine outlet NOx high • Faulty aftertreatment intake NOx sensor
FMI 3	• Voltage above normal, or shorted to high source	• Short Circuit, aftertreatment intake NOx signal	• MIL illuminated	• Faulty wiring between aftertreatment intake NOx sensor and sensor electronic control module • Faulty aftertreatment intake NOx sensor
FMI 5	• Current below normal or open circuit	• Open Circuit, aftertreatment intake NOx signal	• MIL illuminated	• Faulty wiring between aftertreatment intake NOx sensor and sensor electronic control module • Faulty aftertreatment intake NOx sensor
FMI 9	• Abnormal update rate	• Missing signal from aftertreatment intake NOx sensor	• MIL illuminated • Yellow Check lamp illuminated	• Loss of communication from aftertreatment intake NOx sensor electronic control module and engine control module (ECM)
FMI 11	• Root cause not known	• Aftertreatment intake NOx sensor measures near zero for long time with high load	• MIL illuminated	• Faulty aftertreatment intake NOx sensor
FMI 12	• Bad intelligent device or component	• Aftertreatment intake NOx sensor, signal corrupt (incorrect value)	• MIL illuminated	• Faulty aftertreatment intake NOx sensor
FMI 13	• Out of calibration	• Aftertreatment intake NOx, sensor activation (incorrect value)	• MIL illuminated	• Faulty aftertreatment intake NOx sensor
FMI 14	• Special instructions	• Missing signal from aftertreatment intake NOx sensor due to battery voltage	• MIL illuminated	• Voltage to aftertreatment intake NOx sensor is too high or too low • Faulty aftertreatment intake NOx sensor

ECM SPN 3226, Aftertreatment Outlet NOx – MID 128 PPID 270/ PSID 90

MID 233 Fault code sent by MID 128 engine control module (ECM)

Type of fault	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause
FMI 2	• Data erratic, intermittent or incorrect	• Aftertreatment intake NOx sensor error (plausibility) • Mismatch between aftertreatment intake NOx sensor and aftertreatment outlet NOx sensor	• MIL illuminated	• Engine outlet NOx high • Faulty aftertreatment outlet NOx sensor • Aftertreatment diesel exhaust fluid (DEF) quality
FMI 3	• Voltage above normal or shorted to high source	• Short Circuit, aftertreatment outlet NOx signal	• MIL illuminated	• Faulty wiring between aftertreatment outlet NOx sensor and sensor electronic control module • Faulty aftertreatment outlet NOx sensor
FMI 5	• Current below normal or open circuit	• Open Circuit, aftertreatment outlet NOx signal	• MIL illuminated	• Faulty wiring between aftertreatment outlet NOx sensor and sensor electronic control module • Faulty aftertreatment outlet NOx sensor
FMI 9	• Abnormal update rate	• Missing signal from aftertreatment outlet NOx sensor	• MIL illuminated • Yellow Check lamp illuminated	• Loss of communication from aftertreatment outlet NOx sensor electronic control module and engine control module (ECM)
FMI 11	• Root cause not known	• Aftertreatment outlet NOx sensor measures near zero for long time with high load	• MIL illuminated	• Faulty aftertreatment outlet NOx sensor
FMI 12	• Bad intelligent device or component	• Aftertreatement outlet NOx sensor, signal corrupt (incorrect value)	• MIL illuminated	• Faulty aftertreatment outlet NOx sensor
FMI 13	• Out of calibration	• Aftertreatement outlet NOx sensor, activation (incorrect value)	• MIL illuminated	• Faulty aftertreatment outlet NOx sensor
FMI 14	• Special instructions	• Missing signal from aftertreatment outlet NOx sensor due to battery voltage	• MIL illuminated	• Voltage to aftertreatment outlet NOx sensor is too high or too low • Faulty harness to aftertreatement outlet NOx sensor

ECM SPN 3245, Aftertreatment Diesel Particulate Filter (DPF) Outlet Temperature – MID 128 PPID 436

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	• Data valid but above normal operational range - Most severe level	• Aftertreatment DPF outlet temperature critically too high	• Low engine power	• Restricted Catalyst • Intake air leak • Faulty aftertreatment DPF outlet temperature sensor
FMI 2	• Data erratic, intermittent or incorrect	• Aftertreatment DPF outlet temperature sensor is not rational (plausibility)	• MIL illuminated • Aftertreatment regeneration not possible	• Faulty aftertreatment DPF outlet temperature sensor • Exhaust system leak • Faulty harness connectors or connections
FMI 4	• Voltage below normal, or shorted to low source	• Short to ground on the metering side of the circuit	• MIL illuminated • Aftertreatment regeneration not possible	• Faulty harness • Faulty aftertreatment DPF outlet temperature sensor • Aftertreatment control module (ACM)
FMI 5	• Current below normal or open circuit	• Short to battery on the metering side of the circuit • Open in the metering side of the circuit • Open in the ground side of the circuit	• MIL illuminated	• Faulty harness • Faulty aftertreatment DPF outlet temperature sensor • Aftertreatment control module (ACM)
FMI 15	• Data valid but above normal operating range - Least severe level	• Aftertreatment DPF outlet temperature sensor is out of range (high) • Aftertreatment DPF outlet temperature sensor indicates a invalid value	• MIL illuminated	• Faulty harness • Faulty aftertreatment DPF outlet temperature sensor

ECM SPN 3249, Aftertreatment Diesel Particulate Filter (DPF) Intake Temperature – MID 128 PPID 387

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 2	• Data erratic, intermittent or incorrect	• Aftertreatment DPF intake temperature sensor is not rational (plausibility)	• MIL illuminated • Aborted aftertreatment regeneration	• Faulty harness • Faulty harness connectors or connections • Exhaust system leak • Faulty aftertreatment DPF intake temperature sensor
FMI 4	• Voltage below normal, or shorted to low source	• Short to ground on the metering side of the circuit	• MIL illuminated • Aborted aftertreatment regeneration	• Faulty harness • Faulty aftertreatment DPF intake temperature sensor • Aftertreatment control module (ACM)
FMI 5	• Current below normal or open circuit	• Short to battery on the metering side of the circuit • Open in the metering side of the circuit • Open in the ground side of the circuit	• MIL illuminated • Aftertreatment regeneration not possible	• Faulty harness • Faulty aftertreatment DPF intake temperature sensor • Aftertreatment control module (ACM)
FMI 15	• Data valid but above normal operating range - Least severe level	• Aftertreatment DPF intake temperature sensor is out of range (high) • Aftertreatment DPF intake temperature sensor indicates a invalid value	• MIL illuminated	• Faulty harness • Faulty aftertreatment DPF intake temperature sensor

ECM SPN 3251, Aftertreatment Diesel Particulate Filter (DPF) Differential Pressure – MID 128 PID 81

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	• Data valid but above normal operational range	• Critically high pressure	• Engine derate • Red Stop lamp illuminated	• Aftertreatment DPF differential pressure sensor failure
FMI 2	• Data erratic, intermittent or incorrect	• Aftertreatment DPF differential pressure sensor is not rational	• MIL illuminated	• Aftertreatment DPF differential pressure sensor failure

FMI 3	• Voltage above normal, or shorted to high source	• Short to battery on the metering side • Open in the ground line	• MIL illuminated	• Aftertreatment DPF differential pressure sensor failure • Faulty aftertreatment DPF differential pressure sensor connector • Faulty harness
FMI 5	• Current below normal or open circuit	• Open in 5 volt supply line • Short to ground in metering line • Open in metering line	• MIL illuminated	• Aftertreatment DPF differential pressure sensor failure • Faulty harness
FMI 16	• Data valid but above normal operating range - Moderately severe level	• Moderately high pressure	• Engine derate	• Aftertreatment DPF differential pressure sensor failure

ECM SPN 3363, Aftertreatment Diesel Exhaust Fluid (DEF) Tank Heater – MID 128 PSID 75

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 2	• Data erratic, intermittent or incorrect	• Commanded valve position is not plausible	• N/A	• Faulty harness or connectors • Aftertreatment DEF tank temperature sensor • Aftertreatment DEF tank heating valve
FMI 3	• Voltage above normal, or shorted to high source	• Circuit shorted +	• N/A	• Aftertreatment DEF pump assembly
FMI 4	• Voltage below normal, or shorted to low source	• Circuit shorted – • Open circuit	• N/A	• Aftertreatment DEF pump assembly
FMI 5	• Current below normal or open circuit	• Open circuit	• N/A	• Aftertreatment DEF pump assembly

ECM SPN 3471, Aftertreatment Fuel Pressure Control Actuator – MID 128 PPID 328

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	• Voltage above normal, or shorted to high source	• Circuit shorted to battery	• MIL illuminated • Yellow Check lamp illuminated • Aborted aftertreatment regeneration	• Faulty harness • Aftertreatment fuel pressure control actuator failure

FMI 4	• Voltage below normal, or shorted to low source	• Circuit shorted to ground	• MIL illuminated • Yellow Check lamp illuminated • Aborted aftertreatment regeneration	• Faulty harness • Aftertreatment fuel pressure control actuator failure
FMI 5	• Current below normal or open circuit	• Open circuit	• MIL illuminated • Yellow Check lamp illuminated • Aborted aftertreatment regeneration	• Faulty harness • Aftertreatment fuel pressure control actuator failure
FMI 7	• Mechanical system not responding or out of adjustment	• Aftertreatment hydrocarbon doser fuel pressure too low	• MIL illuminated • Yellow Check lamp illuminated • Aftertreatment regeneration not possible	• Aftertreatment fuel shut off valve stuck open • Faulty fuel pressure sensor
FMI 14	• Special instructions	• Aftertreatment hydrocarbon doser fuel pressure too high	• MIL illuminated • Yellow Check lamp illuminated • Aftertreatment regeneration not possible	• Aftertreatment fuel shut off valve leakage

ECM SPN 3480, Aftertreatment Diesel Particulate Filter (DPF) Fuel Pressure – MID 128 PPID 437/PSID 108

Type of fault:	**FMI Description:**	**Fault Condition:**	**Possible Symptoms:**	**Possible Cause:**
FMI 2	• Data erratic, intermittent or incorrect	• DPF fuel pressure sensor is not rational (plausibility) • Aftertreatment hydrocarbon doser fuel pressure too low	• MIL illuminated • Yellow Check lamp illuminated • Aftertreatment regeneration not possible	• Faulty aftertreatment fuel shut off valve • Faulty aftertreatment DPF fuel pressure sensor • Air in fuel • Fuel filter • Aftertreatment fuel pump
FMI 3	• Voltage above normal or shorted to high source	• Short to battery on the metering side • Open in the ground line	• MIL illuminated • Yellow Check lamp illuminated • Aftertreatment regeneration not possible	• Faulty harness • Faulty aftertreatment DPF fuel pressure sensor

FMI 5	• Current below normal or open circuit	• Open circuit in the 5 volt supply • Short circuit to ground in the metering line • Open circuit in the metering line	• MIL illuminated • Yellow Check lamp illuminated • Aftertreatment regeneration not possible	• Faulty harness • Faulty aftertreatment DPF fuel pressure sensor
FMI 7	• Mechanical system not responding or out of adjustment	• Mechanical problem	• MIL illuminated • Engine derate • Possible engine shutdown • Aftertreatment regeneration not possible	• Faulty aftertreatment hydrocarbon doser system • Aftertreatment hydrocarbon doser • Faulty aftertreatment fuel shut off valve • Aftertreatment fuel pump
FMI 10	• Abnormal rate of change	• Aftertreatment hydrocarbon doser fuel pressure sensor stuck • Aftertreatment hydrocarbon doser fuel pressure too high	• MIL illuminated • Yellow Check lamp illuminated • Aftertreatment regeneration not possible	• Faulty fuel pressure sensor • Faulty shut off valve • Aftertreatment hydrocarbon doser
FMI 15	• Data valid but above normal operating range - Least severe level	• Fuel pressure sensor is out of range • Sensor indicates a invalid value	• MIL illuminated	• Faulty fuel pressure sensor

ECM SPN 3483, Aftertreatment Regeneration Status – MID 128 PSID 47

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	• Data valid but above normal operational range - Most severe level	• Unable to achieve needed aftertreatment temperature	• MIL illuminated • Possible incomplete aftertreatment regeneration	• Aftertreatment hydrocarbon doser clogged • Aftertreatment hydrocarbon doser fuel pressure too low
FMI 1	• Data valid but below normal operational range	• Aftertreatment system temperature too high	• MIL illuminated • Possible incomplete aftertreatment regeneration	• Aftertreatment hydrocarbon doser clogged • Aftertreatment hydrocarbon doser fuel pressure too high
FMI 12	• Bad intelligent device or component	• Regeneration efficiency too low	• N/A	• Aftertreatment hydrocarbon doser clogged • Aftertreatment diesel particulate filter (DPF) catalyst damaged • Aftertreatment diesel particulate filter (DPF) catalyst clogged

FMI 15	• Data valid but above normal operating range - Least severe level	• Unable to achieve needed temperature	• MIL illuminated • Possible incomplete aftertreatment regeneration	• Aftertreatment hydrocarbon doser clogged • Aftertreatment hydrocarbon doser fuel pressure too low
FMI 17	• Data valid but below normal operating range - Least severe level	• Aftertreatment temperature too high	• MIL illuminated • Possible incomplete aftertreatment regeneration	• Aftertreatment hydrocarbon doser clogged • Aftertreatment hydrocarbon doser fuel pressure too high

ECM SPN 3509, Sensor Supply Voltage 1 – MID 128 SID 232

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	• Voltage above normal, or shorted to high source	• Sensor supply voltage out of range (high)	• MIL illuminated • Incorrect sensor values	• Faulty harness or connector
FMI 4	• Voltage below normal, or shorted to low source	• Sensor supply voltage out of range (low)	• MIL illuminated • Incorrect sensor values	• Faulty harness or connector

ECM SPN 3510, Sensor Supply Voltage 2 – MID 128 SID 211

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	• Voltage above normal, or shorted to high source	• Circuit shorted +	• MIL illuminated • Incorrect sensor values	• Faulty harness or connector
FMI 4	• Voltage below normal, or shorted to low source	• Circuit shorted –	• MIL illuminated • Incorrect sensor values	• Faulty harness or connector

ECM SPN 3511, Sensor Supply Voltage 3 – MID 128 PSID 113

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	• Voltage above normal, or shorted to high source	• Circuit shorted +	• MIL illuminated	• Faulty harness
FMI 4	• Voltage below normal, or shorted to low source	• Circuit shorted –	• MIL illuminated	• Faulty harness

ECM SPN 3512, Sensor Supply Voltage 4 – MID 128 PSID 126

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	• Voltage above normal, or shorted to high source	• Sensor supply circuit shorted +	• MIL illuminated • Incorrect sensor values	• Faulty harness
FMI 4	• Voltage below normal, or shorted to low source	• Sensor supply circuit shorted –	• MIL illuminated • Incorrect sensor values	• Faulty harness

ECM SPN 3522, Aftertreatment Total Fuel Used – MID 128 PSID 91

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	• Data valid but above normal operational range	• Aftertreatment Diesel Exhaust Fluid (DEF) level change too much	• N/A	• Aftertreatment DEF system leak • Wrong aftertreatment DEF tank • Aftertreatment DEF dosing module failure or wrong module
FMI 1	• Data valid but below normal operational range	• Aftertreatment Diesel Exhaust Fluid (DEF) level change too little	• N/A	• Aftertreatment DEF tank level sensor stuck • Aftertreatment DEF system clog • Wrong aftertreatment DEF tank • Aftertreatment DEF dosing module failure or wrong module
FMI 16	• Data valid but above normal operating range - Moderately severe level	• Aftertreatment Diesel Exhaust Fluid (DEF) level change too much	• N/A	• Aftertreatment DEF system leak • Wrong aftertreatment DEF tank • Aftertreatment DEF dosing module failure or wrong module
FMI 18	• Data valid but below normal operating range - Moderately severe level	• Aftertreatment Diesel Exhaust Fluid (DEF) level change too little	• N/A	• Aftertreatment DEF tank level sensor stuck • Aftertreatment DEF system clog • Wrong aftertreatment DEF tank • Aftertreatment DEF dosing module failure or wrong module

ECM SPN 3556, Aftertreatment Hydrocarbon Doser – MID 128 PPID 329

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	• Voltage above normal, or shorted to high source	• Circuit shorted to battery	• MIL illuminated • Yellow Check lamp illuminated • Aftertreatment regeneration not possible	• Faulty harness • Aftertreatment hydrocarbon doser failure

FMI 4	• Voltage below normal, or shorted to low source	• Circuit shorted to ground	• MIL illuminated • Yellow Check lamp illuminated • Aftertreatment regeneration not possible	• Faulty harness • Aftertreatment hydrocarbon doser failure
FMI 5	• Current below normal or open circuit	• Open circuit	• MIL illuminated • Yellow Check lamp illuminated • Aftertreatment regeneration not possible	• Faulty harness • Aftertreatment hydrocarbon doser failure
FMI 13	• Out of calibration	• Aftertreatment hydrocarbon doser clogged	• MIL illuminated	• Aftertreatment hydrocarbon doser failure • Aftertreatment fuel shut off valve • Aftertreatment fuel supply failure
FMI 14	• Special instructions	• Aftertreatment hydrocarbon doser leaking	• MIL illuminated • Yellow Check lamp illuminated • Aftertreatment regeneration not possible	• Aftertreatment hydrocarbon doser failure

ECM SPN 3597, Aftertreatment Diesel Particulate Filter (DPF) Regeneration too Frequent – MID 128 PSID 119

Type of fault:	**FMI Description:**	**Fault Condition:**	**Possible Symptoms:**	**Possible Cause:**
FMI 3	• Voltage above normal, or shorted to high source	• Circuit shorted +	• MIL illuminated	• Faulty harness • Faulty connector • Aftertreatment Control Module (ACM)
FMI 4	• Voltage below normal, or shorted to low source	• Circuit shorted –	• MIL illuminated	• Faulty harness • Faulty connector • Aftertreatment Control Module (ACM)

ECM SPN 3675, Engine Turbocharger Compressor Bypass Valve Position – MID 128 PPID 330

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	• Voltage above normal, or shorted to high source	• Circuit shorted + • On/off valve can't be activated	• MIL illuminated • Yellow electronic malfunction lamp illuminated • Aftertreatment regeneration not possible • High engine braking without request • Driveability affected	• Faulty bypass valve solenoid • Faulty harness • Faulty harness connector
FMI 4	• Voltage below normal, or shorted to low source	• Short circuit - • Valve constantly activated	• MIL illuminated • Yellow Check lamp illuminated • Major engine derate • Exhaust manifold overheating • Engine shut down	• Faulty bypass valve solenoid • Faulty harness • Faulty harness connector
FMI 5	• Current below normal or open circuit	• Open circuit • On/off valve can't be activated	• MIL illuminated • Yellow Check lamp illuminated • Aftertreatment regeneration not possible • High engine braking without request • Driveability affected	• Faulty bypass valve solenoid • Faulty harness • Faulty harness connector
FMI 7	• Mechanical system not responding or out of adjustment	• Mechanically Stuck • On/off valve can't be activated	• MIL illuminated • Yellow Check lamp illuminated • Aftertreatment regeneration not possible • High engine braking without request • Driveability affected • Valve constantly activated	• Leaking pipes • Faulty bypass valve solenoid

			• Major engine derate • Exhaust manifold overheating • Engine shut down	

ECM SPN 3936, Aftertreatment Diesel Particulate Filter (DPF) System – MID 128 PSID 28

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	• Data valid but above normal operational range - Most severe level	• Aftertreatment DPF differential pressure sensor value too high	• MIL illuminated	• Aftertreatment DPF differential pressure sensor • Aftertreatment DPF
FMI 1	• Data valid but below normal operational range - Most severe level	• Aftertreatment DPF differential pressure sensor value too low	• MIL illuminated	• Aftertreatment DPF differential pressure sensor • Aftertreatment DPF

ECM SPN 4094, NOx Limits Exceeded Due to Insufficient Diesel Exhaust Fluid (DEF) Quality – MID 128 PSID 90

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 1	• Data valid but below normal operational range - Most severe level	• Aftertreatment DEF dosing too low	• Yellow Check lamp illuminated • Engine derate	• DEF quality • Aftertreatment DEF line clogged • Aftertreatment DEF doser • Aftertreatment control module failure
FMI 14	• Special Instructions	• Aftertreatment DEF dosing too low	• Yellow Check lamp illuminated • Engine derate	• DEF quality • Aftertreatment DEF line clogged • Aftertreatment DEF doser • Aftertreatment control module failure
FMI 18	• Data valid but below normal operating range - Moderately severe level	• Aftertreatment DEF dosing too low	• Yellow Check lamp illuminated • Engine derate	• DEF quality • Aftertreatment DEF line clogged • Aftertreatment DEF doser • Aftertreatment control module failure

ECM SPN 4095, NOx Limits Exceeded Due to Interrupted Diesel Exhaust Fluid (DEF) Dosing – MID 128 PSID 90

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 7	• Mechanical system not responding or out of adjustment	• Dosing failure	• MIL illuminated • Aftertreatment DEF low usage	• DEF level • Faulty DEF pump • Leak in DEF hose

ECM SPN 4334, Afterteatment Diesel Exhaust Fluid (DEF) Dosing Absolute Pressure – MID 128 PPID 273

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 1	• Data valid but below normal operational range - Most severe level	• DEF system leakage detected	• MIL illuminated • No Aftertreatment DEF dosing	• DEF pump assembly • DEF hose • Aftertreatment DEF dosing valve
FMI 4	• Voltage below normal, or shorted to low source	• Short Circuit -	• MIL illuminated • No Aftertreatment DEF dosing	• Aftertreatment DEF pump assembly
FMI 5	• Current below normal or open circuit	• Short Circuit + • Open Circuit	• MIL illuminated • Yellow Check lamp illuminated • No Aftertreatment DEF dosing	• Aftertreatment DEF pump assembly

ECM SPN 4354, Aftertreatment Diesel Exhaust Fluid (DEF) Line Heater 1 – MID 128 PSID 103

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	• Voltage above normal, or shorted to high source	• Circuit shorted +	• N/A	• Faulty harness • Faulty connector • Aftertreatment DEF line heater 1 failure
FMI 4	• Voltage below normal, or shorted to low source	• Circuit shorted –	• N/A	• Faulty harness • Faulty connector • Aftertreatment DEF line heater 1 failure
FMI 5	• Current below normal or open circuit	• Open circuit	• N/A	• Faulty harness • Faulty connector • Aftertreatment DEF line heater 1 failure

ECM SPN 4356, Aftertreatment Diesel Exhaust Fluid (DEF) Line Heater 3 – MID 128 PSID 102

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	• Voltage above normal, or shorted to high source	• Circuit shorted +	• N/A	• Faulty harness • Faulty connector • Aftertreatment DEF line heater 3 failure

FMI 4	• Voltage below normal, or shorted to low source	• Circuit shorted –	• N/A	• Faulty harness • Faulty connector • Aftertreatment DEF line heater 3 failure
FMI 5	• Current below normal or open circuit	• Open circuit	• N/A	• Faulty harness • Faulty connector • Aftertreatment DEF line heater 3 failure

ECM SPN 4375, Aftertreatment Diesel Exhaust Fluid Pump (DEF) Drive Percentage – MID 128 PSID 121

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	• Data valid but above normal operational range - Most severe level	• Circuit shorted +	• MIL illuminated • No aftertreatment DEF dosing	• Faulty harness • Faulty connector • Aftertreatment DEF pump assembly failure
FMI 1	• Data valid but below normal operational range - Most severe level	• Circuit shorted – • Open circuit	• MIL illuminated • No aftertreatment DEF dosing	• Faulty harness • Faulty connector • Aftertreatment DEF pump assembly failure
FMI 3	• Voltage above normal, or shorted to high source	• Circuit shorted +	• MIL illuminated • No aftertreatment DEF dosing	• Faulty harness • Faulty connector • Aftertreatment DEF pump assembly failure
FMI 4	• Voltage below normal, or shorted to low source	• Circuit shorted –	• MIL illuminated • No aftertreatment DEF dosing	• Faulty harness • Faulty connector • Aftertreatment DEF pump assembly failure
FMI 5	• Current below normal or open circuit	• Open circuit	• MIL illuminated • No aftertreatment DEF dosing	• Faulty harness • Faulty connector • Aftertreatment DEF pump assembly failure
FMI 11	• Root cause not known	• Aftertreatment DEF filter full	• Yellow Check lamp illuminated	• Aftertreatment DEF filter

FMI 12	• Bad intelligent device or component	• Open circuit	• MIL illuminated • No aftertreatment DEF dosing	• Faulty harness • Faulty connector • Aftertreatment DEF pump assembly failure
FMI 14	• Special instructions	• Voltage to pump out of range	• MIL illuminated • No aftertreatment DEF dosing	• Faulty harness • Faulty connector • Aftertreatment DEF pump assembly failure
FMI 16	• Data valid but above normal operating range - Moderately severe level	• Aftertreatment DEF filter full	• Yellow Check lamp illuminated	• Aftertreatment DEF filter

ECM SPN 4376, Aftertreatment Diesel Exhaust Fluid (DEF) Return Valve – MID 128 PSID 105

Type of fault:	**FMI Description:**	**Fault Condition:**	**Possible Symptoms:**	**Possible Cause:**
FMI 4	• Voltage below normal, or shorted to low source	• Circuit shorted – • Open circuit	• MIL illuminated • Not possible to perform afterrun	• Faulty harness • Faulty connector • Aftertreatment DEF pump assembly failure
FMI 5	• Current below normal or open circuit	• Open circuit	• MIL illuminated • Not possible to perform afterrun	• Faulty harness • Faulty connector • Aftertreatment DEF pump assembly failure
FMI 7	• Mechanical system not responding or out of adjustment	• Possible mechanical problem with aftertreatment DEF return valve	• MIL illuminated • Not possible to perform afterrun	• Mechanical fault – aftertreatment DEF return line restricted between DEF pump and DEF tank • Aftertreatment DEF pump assembly

ECM SPN 4752, Engine Exhaust Gas Recirculation (EGR) Cooler Efficiency – MID 128 SID 282

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 7	• Mechanical system not responding or out of adjustment	• Low EGR cooler efficiency	• MIL illuminated	• EGR cooler clogged or damaged

ECM SPN 4811, Engine Piston Cooling Oil Pressure – MID 128 PPID 8

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 1	• Data valid but below normal operational range - Most severe level	• Pressure below range	• Red Stop lamp illuminated	• N/A
FMI 2	• Data erratic, intermittent or incorrect	• Sensor rationality fault	• Yellow Check lamp illuminated	• Faulty sensor • Faulty valve
FMI 3	• Voltage above normal or shorted to high source	• Short to battery in metering line	• Yellow Check lamp illuminated	• Faulty harness
FMI 5	• Current below normal or open circuit	• Open in the metering side sensor circuit • Open circuit in the ground line sensor circuit	• Yellow Check lamp illuminated	• Faulty sensor • Faulty harness

ECM SPN 4813, Engine Oil Thermostat Bypass Valve Opening – MID 128 PSID 72

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	• Voltage above normal, or shorted to high source	• Circuit shorted +	• Yellow Check lamp illuminated • Oil thermostat is always open	• Faulty actuator • Faulty harness

FMI 4	• Voltage below normal, or shorted to low source	• Circuit shorted –	• Yellow Check lamp illuminated • Oil thermostat is always closed • Engine may overheat	• Faulty actuator • Faulty harness
FMI 5	• Current below normal or open circuit	• Open circuit	• Yellow Check lamp illuminated • Oil thermostat is always open • May have increased fuel consumption	• Faulty actuator • Faulty harness

ECM SPN 4815, Engine Cooling Fan Thermal Switch Position – MID 128 PPID 333

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	• Voltage above normal, or shorted to high source	• Circuit shorted to battery	• Yellow Check lamp illuminated	• Faulty harness • Faulty harness connector • Faulty sensor
FMI 4	• Voltage below normal, or shorted to low source	• Short circuit -	• Yellow Check lamp illuminated	• Faulty harness • Faulty harness connector • Faulty sensor
FMI 5	• Current below normal or open circuit	• Open circuit	• Yellow Check lamp illuminated	• Faulty harness • Faulty harness connector • Faulty sensor

ECM SPN 5246, Aftertreatment SCR Operator Inducement Severity – MID 128 PSID 46

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	• Data valid but above normal operational range - Most severe level	• Severe SCR system fault detected – Warning fault	• Severe engine derate	• N/A
FMI 15	• Data valid but above normal operating range - Least severe level	• Moderate SCR system fault detected – Warning fault	• Moderate engine derate	• N/A
FMI 16	• Data valid but above normal operating range - Moderately severe level	• SCR system fault detected – Warning fault	• Engine derate	• N/A

ECM SPN 5298, Aftertreatment Diesel Oxidation Catalyst (DOC) Conversion Efficiency – MID 128 PSID 99

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 7	• Mechanical system not responding properly	• Hydrocarbon conversion is too low in the DOC	• MIL illuminated	• Aftertreatment DOC catalyst failure • Aftertreatment DOC temperature sensor
FMI 18	• Data valid but below normal operating range - Moderately severe level	• Hydrocarbon conversion is too low in the DOC	• MIL illuminated	• Aftertreatment DOC catalyst failure • Aftertreatment DOC temperature sensor

ECM SPN 5319, Aftertreatment 1 Diesel Particulate Filter (DPF) Incomplete Regeneration – MID 128 PSID 47

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 13	• Calibration values outside limits	• Incomplete aftertreatement regeneration	• MIL illuminated	• Aftertreatment fuel line clogged • Aftertreatment hydrocarbon doser
FMI 31	• Condition exists	• Incomplete aftertreatement regeneration	• MIL illuminated	• Aftertreatment fuel line clogged • Aftertreatment hydrocarbon doser

ECM SPN 5392, Aftertreatment Diesel Exhaust Fluid (DEF) Dosing Valve Loss of Prime – MID 128 PSID 121

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 7	• Mechanical system not responding properly	• Aftertreatment DEF pressure build up failure	• MIL illuminated • Yellow Check lamp illuminated • No Aftertreatment DEF dosing	• Empty aftertreatment DEF tank • Aftertreatment DEF filter clogged • Aftertreatment DEF inlet pipe leak or blockage • Aftertreatment DEF pump assembly
FMI 31	• Condition exists	• Aftertreatment Diesel Exhaust Fluid (DEF) pressure build up failure	• MIL illuminated • Yellow Check lamp illuminated • No Aftertreatment DEF dosing	• Empty aftertreatment DEF tank • Aftertreatment DEF filter clogged • Aftertreatment DEF inlet pipe leak or blockage • Aftertreatment DEF pump assembly

ECM SPN 5394, Aftertreatment Diesel Exhaust Fluid (DEF) Dosing Valve – MID 128 PSID 89/90

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 1	• Data valid but below normal operational range	• Dosing failure • Aftertreatment DEF dosing amount too low or DEF quality	• MIL illuminated • Aftertreatment outlet NOx emissions too high	• Aftertreatment outlet NOx sensor • Selective catalytic reduction (SCR) catalyst malfunction • Exhaust gas recirculation (EGR) mass flow failure • Selective catalytic reduction (SCR) inlet temperature sensor
FMI 4	• Voltage below normal, or shorted to low source	• Circuit shorted –	• MIL illuminated	• Aftertreatment DEF dosing pump assembly
FMI 5	• Current below normal or open circuit	• Open circuit	• MIL illuminated • Yellow Check lamp illuminated	• Aftertreatment DEF dosing valve • Aftertreatment DEF dosing pump assembly
FMI 14	• Special instructions	• Aftertreatment DEF Dosing valve clogged or hose clogged	• MIL illuminated • Yellow Check lamp illuminated	• Aftertreatment DEF dosing valve clogged • Hose clogged
FMI 17	• Data valid but below normal operating range - Least severe level	• Dosing failure • Aftertreatment DEF dosing amount too low or DEF quality	• MIL illuminated • Aftertreatment outlet NOx emissions too high	• Aftertreatment outlet NOx sensor • Selective catalytic reduction (SCR) catalyst malfunction • Exhaust gas recirculation (EGR) mass flow failure • Selective catalytic reduction (SCR) inlet temperature sensor

ECM SPN 5397, Aftertreatment 1 Diesel Particulate Filter (DPF) Regeneration Too Frequent – MID 128 PSID 47

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 10	• Abnormally strong vibrations	• Aftertreatment regenerations frequency too high	• MIL illuminated • Too frequent aftertreatment regenerations	• Engine out soot too high • Exhaust gas recirculation system fault • Engine injectors • Air leak
FMI 31	• Condition exists	• Aftertreatment regenerations frequency too high	• MIL illuminated • Too frequent aftertreatment regenerations	• Engine out soot too high • Exhaust gas recirculation system fault • Engine injectors • Air leak

ECM SPN 5485, Aftertreatment Diesel Exhaust Fluid (DEF) Pump Orifice – MID 128 PSID 121

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 11	• Root cause not known	• Aftertreatment DEF bleed orifice clogged	• MIL illuminated • Yellow Check lamp illuminated • No Aftertreatment DEF dosing	• Bleed orifice • Aftertreatment DEF pressure sensor

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