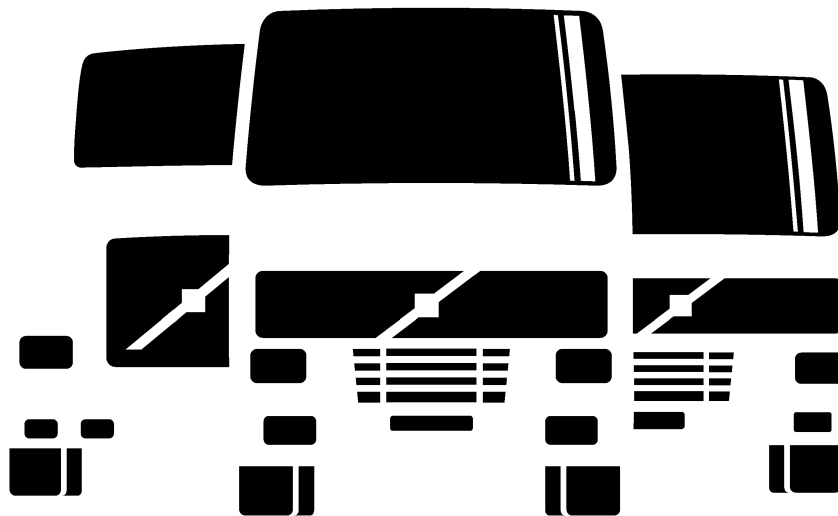


Service Manual Trucks

Group **28, 36, 43**
Fault Code Guide
2007 Emissions
VN, VHD VERSION2, VT



Foreword

Descriptions and instructions in this handbook are based on design and method studies up to and including 1.2007.

The products are under continual development. Values and repair methods may therefore differ on vehicles and components manufactured after this date.

This service information uses the following observation and warning levels:

Note!	Indicates a situation, use or circumstance that should be emphasized.
Important!	Indicates a situation, where a special service hint or technique is used.
Caution!	Indicates a situation that, unless avoided, can lead to physical damage to the product.
Warning!	Indicates a dangerous situation that, unless avoided, can lead to personal injury.
Danger!	Indicates a dangerous situation that, unless avoided, can lead to serious personal injury or death.

Order number: PV776-20180137

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Group 28

Design and Function

Engine Control System

The "Premium Tech Tool" (PTT) is the preferred tool for performing diagnostic work. Contact your local dealer for more information.

System Overview

Five electronic control modules are used; the Engine Management System (EMS) Module, Instrument Cluster Module (ICM), Vehicle Electronic Control Unit (VECU), Transmission Electronic Control Unit (TECU) and the Gear Selector Electronic Control Unit (GSECU). Together, these modules operate and communicate through the J1939 high speed serial data line to control a variety of engine and vehicle cab functions. The Engine Management System (EMS) Module controls fuel timing and delivery, fan operation, engine protection functions, engine brake operation, the EGR valve, and the turbocharger nozzle. The Vehicle Electronic Control Unit (VECU) controls cruise control functions, accessory relay controls and idle shutdown functions. The Instrument Cluster Module (ICM) primarily displays operational parameters and communicates these to the other ECU's. All have the capability to communicate over the J1587 normal speed data lines primarily for programming, diagnostics and data reporting.

In addition to their control functions, the modules have on-board diagnostic capabilities. The on-board diagnostics are 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 illumination a malfunction indicator lamp 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 the "limp home" mode. The limp home mode allows continued vehicle operation but the system may substitute a sensor or signal value that may result in poor performance. In some instances, the system will continue to function but engine power may be limited to protect the engine and vehicle. Fault codes logged in the system memory can later be read, to aid in diagnosing the faults, with a diagnostic computer or through the instrument cluster display, if equipped. When diagnosing

an intermittent code or condition, it may be necessary to use a diagnostic computer connected to the Serial Communication Port.

Additional data and diagnostic tests are available when a diagnostic computer is connected to the Serial Communication Port.

For diagnostic software, contact your local dealer.

The Vehicle Electronic Control Unit (VECU) is mounted on a panel below the top dash access panel in the center of the dash on conventional models. The VECU is a microprocessor based controller programmed to perform several functions, these include:

- Driver controls
- Vehicle and engine speed controls
- Starter control
- Cab power
- Idle controls
- Broadcasting data on the serial data lines
- Trip data logging
- Diagnostic fault logging and password processing

The VECU performs these functions by monitoring the signals from sensors and switches, and data received over the serial data lines from the other ECU's. The VECU directly monitors the Throttle Position (TP) Sensor and Vehicle Speed Sensor (VSS).

The VECU also monitors the position or state of a number of switches to perform its control and diagnostic functions. They are:

- A/C Pressure Switch
- Air Suspension Height Control Switch
- Differential Lock Switch
- Engine Brake Switches
- Ignition Key Switch
- PTO Switches (if equipped)
- Service and Park Brake Switches
- Speed Control Switches (Set/Decel, Resume/Accel)
- 5th Wheel Slide Switch

The EMS is a microprocessor based controller programmed to perform fuel injection quantity and timing control, diagnostic fault logging, and to broadcast data to other modules. 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 EMS controls the operation of the Electronic Unit Injectors (EUIs), engine brake solenoid, EGR valve, turbocharger nozzle position, and cooling fan clutch based on input information it receives over the serial data lines and from the following sensors:

- Ambient Air Temperature Sensor
- Ambient Pressure sensor
- Boost Air Pressure (BAP) Sensor
- Camshaft Position (Engine Position) Sensor
- Cooling Fan Speed (CFS) Sensor
- Crankshaft Position (Engine Speed) Sensor
- Differential Pressure DPF Sensor
- EGR Differential Pressure Sensor
- EGR Temperature Sensor

- Engine Coolant Level (ECL) Sensor
- Engine Coolant Temperature (ECT) Sensor
- Engine Oil Pressure (EOP) Sensor
- Engine Oil Level (EOL) Sensor
- Engine Oil Temperature (EOT) Sensor
- Exhaust Temperature Sensor (DPF Sensors)
- Fuel Pressure Sensor
- Intake Air Temperature And Humidity (IATH) Sensor
- Intake Manifold (Boost) Temperature Sensor
- Throttle Position (TP) Sensor
- Turbo Speed Sensor
- Variable Geometry Turbocharger (VGT) Position Sensor

The Vehicle Electronic Control Unit (VECU) and Engine Management System (EMS) Module 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 each module has developed, based on the input information it has received.

Sensors

Ambient Air Temperature Sensor

The Ambient Air Temperature Sensor is used to detect the outside air temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the ambient air temperature. The sensor uses a thermistor that is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.

The Ambient Air Temperature Sensor is located in the front of the vehicle.

Ambient (Atmospheric) Pressure Sensor

The Ambient (Atmospheric) Pressure Sensor contains a pressure sensitive diaphragm and an electrical amplifier. Mechanical pressure applied to the diaphragm causes the diaphragm to deflect and the amplifier to produce an electrical signal proportional to the deflection.

The Ambient (Atmospheric) Pressure Sensor is built into the Engine Management System (EMS) Module.

Camshaft Position Sensor

The Camshaft Position (Engine Position) Sensor is located in the rear face of the timing gear cover at the rear of the engine, near the bottom of the valve cover. It uses magnetic induction to generate a pulsed electrical signal. It senses the passage of seven (7) timing bumps on the edge of the camshaft dampener. Six of the holes correspond to the phasing of the electronic unit injectors, while the seventh hole indicates the top dead center position.

Cooling Fan Speed (CFS) Sensor

On engines with an electronically controlled viscous fan drive, the electronic fan drive contains a Hall effect speed sensor. When the engine is running, a series of vanes in the fan drive housing rotates past a magnet in the fan drive solenoid generating a pulsed voltage signal. The Engine Management System (EMS) Module monitors the status of the air conditioning system and signals from the Engine Coolant Temperature (ECT) Sensor, the Engine Oil Temperature (EOT) Sensor, and the Engine Speed/Timing (RPM/TDC) Sensor and calculates the optimal cooling fan speed.

The Cooling Fan Speed Sensor is located in the fan drive on the front of the engine.

Crankshaft Position (Engine Speed) Sensor

The Crankshaft Position (Engine Speed) Sensor uses magnetic induction to generate a pulsed electrical signal. Notches are machined into the edge of the flywheel. When one of the notches passes close to the sensor, electric pulses result.

The Crankshaft Position (Engine Speed) Sensor also indicates when the crankshaft is at the top dead center position.

Differential Pressure DP Sensor

The differential pressure sensor is used for flow measurement of the Diesel Particulate Filter (DPF). This sensor has two pressure ports and senses the difference in pressure between the two ports. Measurement of the pressure before and after the DPF is used to calculate diesel filter regeneration.

The Differential Pressure DPF Sensor is located on the side of the Diesel Particulate Filter (DPF).

EGR Differential Pressure Sensor

The EGR differential pressure sensor is used for flow measurement of the Exhaust Gas Recirculation (EGR) valve. This sensor has two pressure ports and senses the difference in pressure between the two ports. Measurement of the pressure before and after the EGR valve is used to calculate EGR flow.

The EGR Differential Pressure Sensor is located on the left or right side of the engine.

EGR Temperature Sensor

The EGR temperature sensor detects exhaust gas temperature for EGR system. The sensor modifies a voltage signal from the control unit. The modified signal returns to the control unit as the exhaust temperature of the EGR system to confirm EGR operation. The sensor uses a thermistor that is sensitive to the change in temperature.

The EGR Temperature Sensor is located near the EGR valve.

Engine Coolant Level (ECL) Sensor

The Engine Coolant Level (ECL) Sensor is a switch. If engine coolant level falls below a calibrated point the contacts open and the driver will be notified of the low coolant level.

The Engine Coolant Level (ECL) Sensor is located in the cooling system reservoir tank.

Engine Coolant Temperature (ECT) Sensor

The Engine Coolant Temperature Sensor is located at the front of the engine. The sensor will indicate a high coolant temperature caused by problems like radiator blockage, thermostat failure, heavy load, or high ambient temperatures. This sensor is also used for cold start enhancement and for fan clutch engagement.

Engine Oil Pressure (EOP) Sensor

The Engine Oil Pressure Sensor contains a pressure sensitive diaphragm and a electrical amplifier. Mechanical pressure applied to the diaphragm causes the diaphragm to deflect and the amplifier to produce an electrical signal proportional to the deflection.

The Engine Oil Pressure Sensor is located on the oil filter assembly. The sensor monitors engine oil pressure to warn of lubrication system failure.

Engine Oil Level (EOL) Sensor

The Engine Oil Level Sensor is located in the oil pan.

Engine Oil Temperature (EOT) Sensor

The Engine Oil Temperature Sensor is a thermistor whose resistance varies inversely to temperature. The sensor has a negative temperature coefficient, which means the sensor resistance will decrease as the engine oil temperature increases.

The Engine Oil Temperature Sensor is located in the oil pan.

Exhaust Temperature Sensor (DPF Sensors)

The exhaust gas temperature sensor detects exhaust gas temperature for DPF protection as well as DPF regeneration control. The sensor modifies a voltage signal from the control unit. The modified signal returns to the control unit as the exhaust temperature at that specific location of the exhaust. The sensor uses a thermistor that is sensitive to the change in temperature.

The Exhaust Temperature Sensors are located in the DPF assembly.

Fuel Pressure Sensor

The fuel pressure sensor contains a diaphragm that senses fuel pressure. A pressure change causes the diaphragm to flex, inducing a stress or strain in the diaphragm. The resistor values in the sensor change in proportion to the stress applied to the diaphragm and produces an electrical output.

The Fuel Pressure Sensor is located on top of the fuel filter housing.

Intake Air Temperature and Humidity (IATH) Sensor

The Intake Air Temperature and Humidity (IATH) Sensor contains a thermistor and a capacitive sensor. The resistance of the thermistor varies inversely to temperature. The output of the capacitive sensor increases as the humidity of the surrounding air increases. By monitoring the signals from both portions of the sensor, the Engine Management System (EMS) Module calculates the temperature and humidity of the air passing through the air filter housing.

The Intake Air Temperature and Humidity (IATH) Sensor is located in the air intake tube just downstream from the air filter canister.

Intake Manifold (Boost) Temperature Sensor

The Intake Manifold (Boost) Temperature Sensor is a thermistor whose resistance varies inversely to temperature. The sensor has a negative temperature coefficient, which means the sensor resistance will decrease as the inlet air temperature increases.

The Intake Manifold (Boost) Temperature Sensor is located in the intake manifold.

Intake Manifold Pressure Sensor

The Intake Manifold Pressure Sensor contains a pressure sensitive diaphragm and an electrical amplifier. Mechanical pressure applied to the diaphragm causes the diaphragm to deflect and the amplifier to produce an electrical signal proportional to the deflection.

The Intake Manifold Pressure Sensor is located on the air inlet pipe before the intake manifold.

Throttle Position (TP) Sensor

The Throttle Position Sensor is a potentiometer that is mechanically linked to the accelerator pedal. A potentiometer is a variable resistor whose resistance will change as the pedal is pressed. As the resistance changes, the signal voltage of the sensor changes indicating the accelerator pedal position.

The Throttle Position Sensor is located above the accelerator pedal. The sensor is designed to improve the driver's control by reducing sensitivity to chassis motion. This sensor provides the driver's fuel request input to the VECU.

Turbo Speed Sensor

The Turbo Speed Sensor informs the EMS of the turbo shaft speed. The sensor does not read from the vanes, but reads from the shaft. The Engine Management System (EMS) Module uses this signal in conjunction with the VGT position sensor signal to control the speed of the turbocharger and therefore optimize the intake manifold pressure.

The Turbo Speed Sensor is mounted in the center of the turbocharger.

Variable Geometry Turbocharger Smart Remote Actuator (VGT SRA)

The Variable Geometry Turbocharger Smart Remote Actuator (VGT SRA) takes the position commands from the EMS, moves the nozzle of the turbocharger to the desired position, and performs all of the diagnostics and self checks on the actuator.

MID 130 Transmission Control Unit

The "Premium Tech Tool" (PTT) is the preferred tool for performing diagnostic work. Contact your local dealer for more information.

System Overview

The I-Shift transmission is a technologically advanced automated mechanical transmission, designed specifically to work in conjunction with Volvo's new family of heavy-duty diesel engines. In order to work as a total package, the I-Shift is programmed with each engine's efficiency map and is offered with different software options to fulfill each operator's needs.

All variants of the Volvo I-Shift have 12 forward speeds and up to 4 reverse speeds depending on programming. It is a single countershaft transmission built up with a splitter section, a main section with three forward and one reverse gear, and a range gear section. It is an automated mechanical transmission and uses synchronizers in its splitter and range gears but not in the main section. The main section utilizes a countershaft brake to mesh gears and equalize shaft speeds as needed. A single disc automated clutch system is utilized. The I-Shift is a "two pedal" transmission and does not require a clutch pedal.

The I-Shift uses compressed air and electrical solenoids to perform shift functions, clutch control and countershaft brake functions. All of these functions are timed and controlled by the Transmission Electronic Control Unit (TECU). A dedicated air tank is needed on the vehicle to supply air for these components. The air is plumbed to the transmission via a supply line and is distributed to the other components internally. The air control solenoids are housed in the Transmission Control Housing and in the Clutch Control Valve Assembly.

All Volvo Truck models will be available with this transmission including the VT, VN Series & VHD vocational trucks. Four I-Shift models will be offered to support the power ranges of the engines as well as offering different gear arrangements:

	AT2512C	ATO2512C	AT2812C	ATO3112C
Operation	Two Pedal	Two Pedal	Two Pedal	Two Pedal
Forward Speeds	12	12	12	12
Engines Available	D11/D13	D11/D13	D16	D16
Overall Ratio	14.94:1	15.04:1	14.94:1	15.04:1
Top Ratio	Direct 1.00:1	Overdrive 0.78:1	Direct 1.00:1	Overdrive 0.78:1
Weight lbs (kg)	597 (275)	597 (275)	610 (281)	610 (281)

Transmission Identification

Each transmission has two identification tags. One is found on the top of the clutch housing and the other is found on the back of the range housing. The transmission version can be readily identified by the following nomenclature table.

Make	Volvo
Type	AT2512C, ATO2512C, AT2812C and ATO3112C
Description	A — Automatic T — Transmission O — Overdrive 25 — Torque Capacity 2500 Nm (1850 lb/ft) 28 — Torque Capacity 2800 Nm (2050 lb/ft) 31 — Torque Capacity 3100 Nm (2300 lb/ft) 12 — Number of forward gears C — Design Level

Sensors

Clutch Position Sensor

The Clutch Position Sensor is located on the side of the clutch cylinder assembly (inside bell housing).

Main Shaft Speed Sensor(s)

The speed sensors are located on the control housing and measure the speed of the main shaft and the speed of the countershaft.

The main shaft speed sensor is a electronic sensor with a hall element. Using a hall element makes it possible to measure the rotation speed and rotation direction of the shaft.

The countershaft speed sensor is an inductive sensor. Knowing the speed of the countershaft makes it possible to calculate the precise speed of every gear in the transmission.

The speed sensor(s) are located in the transmission on the lower portion of the control housing.

Output Shaft Speed Sensor

The Output Shaft Speed Sensor is located on the side of the rear transmission housing.

Range Cylinder Position Sensor

There are four position sensors in the transmission control housing. These sensors measure the position of the specific air cylinder within the control housing. The sensors are inductive and the inductive characteristics change depending on the position of the metal pin that follows the movements of the air cylinders.

The Range Cylinder Position Sensor is located in the transmission on the lower portion of the control housing.

Split Cylinder Position Sensor

The Split Cylinder Position Sensor is located in the transmission on the lower portion of the control housing.

1st/Reverse Cylinder Position Sensor

The 1st/Reverse Cylinder Position Sensor is located in the transmission on the lower portion of the control housing.

2nd/3rd Gear Cylinder Position Sensor

The 2nd/3rd Gear Cylinder Position Sensor is located in the transmission on the lower portion of the control housing.

Transmission Electronic Control Unit

The TECU communicates with the Gear Selector ECU and other ECUs in the vehicle through the J1939 and J1587 data buses. The functionality of the TECU can be different depending on the type of software packages that are installed. The TECU contains the following components:

- SAE J11708/1587 CAN
- SAE J1939 CAN
- Powertrain CAN
- 11 Powerdrivers
- Inclination Sensor
- Temperature Sensor
- 9 Controlling Solenoid Valves

The Transmission Electronic Control Unit located on the upper portion of the control housing.

Lubrication System

The transmission is lubricated through a combination of pressure from an oil pump and splashing. The oil is led into the main shaft to lubricate and cool the range gears, the input shaft and main shaft bearings. The countershaft brake and output shaft bearings, are also lubricated. The lubrication system has two overflow valves. One valve ensures that the transmission is lubricated if the filter gets blocked while the other prevents excessive pressure in the system, e.g. during cold start. The valves are made up of a compression spring and a valve peg.

MID 223 Gear Selector Control Unit

The "Premium Tech Tool" (PTT) is the preferred tool for performing diagnostic work. Contact your local dealer for more information.

System Overview

The gear selector is attached to the drivers seat and can be folded away to aid in entering the cabin. There are two available selector configurations, a basic and a premium. The selector in the vehicle is dependant on which program package level the vehicle is built with. Both selectors have gear positions of R (Reverse), N (Neutral), D (Drive), and M (Manual). With the selector in the drive position the transmission will shift as an automatic, performing gear selections and shifting without driver input. When in the manual position, the driver either selects the gears using the gear selector button (premium selector) or will lock the gear that the transmission is presently operating in and hold that gear until the selector is placed in the drive position again (basic selector). With the basic

selector, if the manual position is engaged at a stop the vehicle will start in first and hold that gear. The basic selector isn't equipped with a gear selector button or a economy/performance drive mode button. In situations where the I-Shift is unintentionally left in gear with the parking brake applied, the TECU will automatically go to neutral when the key switch is turned off. This is done to avoid the transmission getting stuck in gear due to drive line "torque up". There is a gear selector electronic control unit (GSECU) that is located in the center of the dash. The GSECU receives signals from the selector and interprets these signals into communication information that is transmitted to the TECU.

Selector Folding

The gear selector is capable of folding forward to aid in cab entry and is also used to identify which software level that is programmed in the Transmission Electronic Control Unit (TECU). With the selector in the neutral position

(N) press in the fold button and the lever can be folded forward. The display will then show the program package level in place of the driving mode. This is found just to the right of the present gear within the display.

Limp Home Mode

Note: Limp Home Mode should only be used to get a vehicle to a safe or secure location. It is not meant for driving any distance.

At times when a sensor failure or certain internal transmission damage has occurred, "Limp Home Mode" can be activated. Press the "L" button on the gear selector and move the gear lever to the D position to active "Limp Home Mode". When activated, L is displayed as the

driving mode in the DID. In "Limp Home Mode", only forward gears 1, 3 and 5 are available for vehicles with the premium selector and only first gear for vehicles with the basic selector. No matter which selector the vehicle has, reverse gear 1 is available also. The vehicle must be stationary to shift gears. The "Limp Home Mode", will be deactivated when the ignition is turned off. This mode is only meant to get a vehicle to a safe or secure location.

Sensors

Gear Selector Electronic Control Unit

The gear selector communicates with the Gear Selector Electronic Control Unit using 8 wires. These wires are used to decode a switch matrix inside the GSECU.

Inside the gear selector lever there are a number of switches. Some of the switches are normal and some are hall-effect switches.

The Gear Selector Electronic Control Unit is located in the center of the dash just rear of the VECU.

Troubleshooting

Engine ECU, Fault Tracing

The “Premium Tech Tool” (PTT) is the preferred tool for performing diagnostic work. Contact your local dealer for more information.

The control units on the information link communicate according to the SAE J1587 standard. The standard has been extended with Volvo's own supplement (PPID, PSID). The fault codes set by the control units contain information that is described by the following abbreviations.

MID	Message Identification Description: Identification of a control unit.	SID	Subsystem Identification Description: Identification of a component.
PID	Parameter Identification Description: Identification of a parameter (value).	PSID	Proprietary Subsystem Identification Description Volvo: Unique identification of a component.
PPID	Proprietary Parameter Identification Description Volvo: Unique identification of a parameter (value).	FMI	Failure Mode Identifier: Identification of fault types.

FMI Table

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

Note: When performing diagnostic test on intermittent faults, gently wiggle the wires and connectors to help find the intermittent faults.

Engine ECU, Fault Tracing

PID

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PPID

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PSID

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MID 128 PID 26 Fan Speed Percent

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	Voltage above normal or shorted to high	- 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

MID 128 PID 45 Preheater Relay

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	Voltage above normal or shorted to high	Short Circuit +, Measuring line	- Preheat relay not activated - White smoke for cold start - Start problems in cold climate	Preheat relay solenoid shorted
FMI 4	Voltage below normal or shorted low	Short Circuit -, Measuring line	- Induction air is hot - Preheat 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 Preheat relay - Faulty harness

MID 128 PID 81 Particulate Filter

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 pressure	- Engine derate - Malfunction indicator lamp illuminated	Particulate Trap Pressure (PTP) Sensor failure
FMI 2	Data erratic, intermittent or incorrect	Sensor is not rational	Malfunction indicator lamp illuminated	Particulate Trap Pressure (PTP) Sensor failure
FMI 3	Voltage above normal or shorted high	- Short to battery on the metering side - Open in the ground line	Malfunction indicator lamp illuminated	- Particulate Trap Pressure (PTP) Sensor failure - Faulty Particulate Trap Pressure (PTP) Sensor connector - Faulty harness
FMI 5	Current below normal or open	- Open in 5 volt supply line - Short to ground in metering line - Open in metering line	Malfunction indicator lamp illuminated	- Particulate Trap Pressure (PTP) Sensor failure - Faulty harness
FMI 12	Bad intelligent device or component	Particulate Trap Pressure (PTP) Sensor signal high or low but still within range	Engine derate	Diesel Particulate Filter (DPF) is damaged, filled with soot or missing

MID 128 PID 84 Vehicle Speed

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 9	Abnormal update rate	Missing signal from VECU	Engine derate	J1708 vehicle speed message does not exist, (VECU error)

MID 128 PID 85 Cruise Control Status

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 9	Abnormal update rate	Missing (Cruise Control) signal from VECU	Cruise Control does not work	No clutch info to EMS (J1939)

MID 128 PID 91 Accelerator Pedal Position

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 9	Abnormal update rate	Missing signal from VECU	N/A	J1708 pedal information not available

MID 128 PID 94 Fuel Delivery Pressure

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 1	Pressure critically low	EMS module detects a low fuel pressure reading	- Rough idle - Uneven running - Engine derate	- A clogged fuel filter - Fuel leaking from a fuel line or fitting - Poor fuel pump pressure - Low fuel level
FMI 3	Voltage high/open	Low Fuel Pressure (FP) Sensor signal line voltage	- Engine derate - Malfunction indicator lamp illuminated	- Damaged contacts in harness - Faulty Fuel Pressure (FP) sensor - Open circuit.
FMI 5	Current low/open	Low Fuel Pressure (FP) Sensor signal line voltage	- Engine derate - Malfunction indicator lamp illuminated	- Damaged contacts in harness - Faulty Fuel Pressure (FP) sensor
FMI 7	Current low/open	Drop in fuel pressure	- Engine derate - Malfunction indicator lamp illuminated	- Clogged fuel filter - Leaking fuel line or fitting - Poor fuel pump response

MID 128 PID 97 Water in Fuel Indicator

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	Voltage high/open	N/A	- Undetected water in fuel supply - Uneven running - Malfunction indicator lamp illuminated	Open circuit
FMI 4	Voltage low	N/A	- Undetected water in fuel supply - Uneven running - Malfunction indicator lamp illuminated	- Short to ground - Open circuit - Faulty sensor

MID 128 PID 98 Engine Oil Level

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 1	Data valid but below normal operational range	- Moderately below range - Critically below range	N/A	- Low oil level Leakage - Critically low oil level Leakage
FMI 4	Voltage below normal or shorted low	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

MID 128 PID 100 Engine Oil Pressure

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	- 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	- 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	- Engine Oil Pressure (EOP) sensor failure - Faulty harness

MID 128 PID 102 Intake Manifold Pressure

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	Data valid but above normal operational range	- Intake Manifold Pressure Sensor output is high - Intake Manifold Pressure is indicating an unphysical value	- Engine derate - Malfunction indicator lamp illuminated	- Variable Geometry Turbo (VGT) actuator stuck - Faulty Intake Manifold Pressure Sensor harness - Intake Manifold Pressure Sensor failure
FMI 1	Data valid but below normal operational range	Intake Manifold Pressure Sensor is indicating an unphysical value	- Engine derate - Malfunction indicator lamp illuminated	- Intermittent fault in the Intake Manifold Pressure Sensor harness - Faulty Boost Air Pressure connector - Intake Manifold Pressure Sensor failure
FMI 2	Data erratic, intermittent or incorrect	Intake Manifold Pressure Sensor output is too high or too low	- Engine derate - Malfunction indicator lamp illuminated	- Intermittent fault in the Intake Manifold Pressure Sensor harness - Faulty Boost Air Pressure connector - Intake Manifold Pressure Sensor failure
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 - Malfunction indicator lamp illuminated	- Intermittent fault in the Intake Manifold Pressure Sensor harness - Faulty Boost Air Pressure connector - Intake Manifold Pressure Sensor failure
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 - Malfunction indicator lamp illuminated	- Intermittent fault in the Intake Manifold Pressure Sensor harness - Faulty Boost Air Pressure connector - Intake Manifold Pressure Sensor failure
FMI 11	Root cause not known (Data Incorrect)	Intake Manifold Pressure Sensor output is too high or low	- Engine derate - Malfunction indicator lamp illuminated	- Faulty Intake Manifold Pressure Sensor harness - Inlet air leakage - Intake Manifold Pressure Sensor failure

MID 128 PID 103 Turbo Speed

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	Data valid but above normal operational range	Turbocharger speed is at least 25% greater than the target wheel speed for the measured boost	- Engine derate - Malfunction indicator lamp illuminated	- Miss detection - Faulty Turbo Speed Sensor harness - Faulty Turbo Speed Sensor connector - Turbo Speed Sensor failure
FMI 1	Data valid but below normal operational range	Turbocharger speed is at least 25% less than the target wheel speed for the measured boost	- Engine derate - Malfunction indicator lamp illuminated	- Miss detection - Faulty Turbo Speed Sensor harness - Faulty Turbo Speed Sensor connector - Turbo Speed Sensor failure
FMI 9	Abnormal update rate (missing sensor signal)	A fault is logged if the Turbo Speed Sensor signal is lost	- Engine derate - Malfunction indicator lamp illuminated	- Communication fault in the metering line of the Turbo Speed Sensor circuit - Short to ground in the metering line of the Turbo Speed Sensor circuit - An open in the metering line of the Turbo Speed Sensor circuit

MID 128 PID 105 Intake Manifold Temperature

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	Data valid but above normal operational range	The Intake Manifold Temperature Sensor is indicating an unphysical value	- Engine derate - Malfunction indicator lamp illuminated	- Faulty Intake Manifold Temperature Sensor or Engine Management System (EMS) Module connector - Temperature Sensor harness - Malfunction Intake Manifold Temperature Sensor
FMI 1	Data valid but below normal operational range	The Boost Temperature Sensor is indicating an unphysical value	- Minor engine derate - Malfunction indicator lamp illuminated	- Faulty Intake Manifold Temperature Sensor or Engine Management System (EMS) Module connector - Break in the Intake Manifold Temperature Sensor harness - Malfunction Intake Manifold Temperature Sensor
FMI 2	Data erratic, intermittent or incorrect	The Intake Manifold Temperature Sensor output is too high or too low	- Engine derate - Malfunction indicator lamp illuminated	- Faulty Intake Manifold Temperature Sensor or Engine Management System (EMS) Module connector - Break in the Intake Manifold Temperature Sensor harness - Malfunction Intake Manifold Temperature Sensor
FMI 4	Voltage below normal or shorted low	N/A	- Difficult to start in cold climates - Engine derate - Malfunction indicator lamp illuminated	- Short circuit - Intermittent fault in the Intake Manifold Temperature Sensor harness - Faulty Intake Manifold Temperature Sensor connector - Intake Manifold Temperature Sensor failure
FMI 5	Current below normal or open circuit	- A short to battery - An open in the 5 volt supply circuit	- Difficult to start in cold climates - Engine derate - Malfunction indicator lamp illuminated	- A short circuit in the metering circuit - Intermittent fault in the Intake Manifold Temperature Sensor harness - Faulty Intake Manifold Temperature Sensor connector - Intake Manifold Temperature Sensor failure
FMI 10	Abnormal rate of change	The Boost Temperature Sensor output is showing a constant value	- Engine derate - Malfunction indicator lamp illuminated	- Faulty Intake Manifold Temperature Sensor harness - Intake Manifold Temperature Sensor failure

MID 128 PID 108 Atmospheric Pressure

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 2	Data erratic, intermittent or incorrect	Atmospheric Pressure Sensor output is too high or too low (abnormal value)	Minor engine derate	- Faulty Atmospheric Pressure Sensor - Faulty Engine Management System (EMS) Module
FMI 3	Voltage above normal or shorted to high source	Short to battery on the metering side	N/A	- Internal fault in the Engine Management System (EMS) Module - Faulty Atmospheric Pressure Sensor
FMI 4	Voltage below normal or shorted to low source	A short to ground on the metering side	N/A	- Internal fault in the Engine Management System (EMS) Module - Faulty Atmospheric Pressure Sensor

MID 128 PID 110 Coolant Temperature

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	Data valid but above normal operational range	The Engine Coolant Temperature (ECT) Sensor is indicating an unphysical value	Malfunction indicator lamp illuminated	- Extreme driving condition - Faulty coolant thermostat - Malfunctioning fan - Blocked radiator
FMI 2	Data erratic, intermittent or incorrect	The Engine Coolant Temperature (ECT) Sensor output is too high or too low	- May affect driveability in extreme cases - Malfunction indicator lamp illuminated	- Faulty Engine Coolant Temperature (ECT) Sensor or Engine Management System (EMS) Module connector - Break in Engine Coolant Temperature (ECT) Sensor harness - Malfunctioning Engine Coolant Temperature (ECT) Sensor
FMI 4	Voltage below normal or shorted low	N/A	- Difficult to start in cold climates - Idle run regulation is deteriorated - Malfunction indicator lamp illuminated	- Internal fault in the Engine Coolant Temperature (ECT) Sensor harness - Faulty Engine Coolant Temperature (ECT) Sensor connector - Faulty Engine Coolant Temperature (ECT) Sensor
FMI 5	Current below normal or open circuit	N/A	- Difficult to start in cold climates - Idle run regulation is deteriorated - Malfunction indicator lamp illuminated	- An open in the Engine Coolant Temperature (ECT) Sensor circuit - An open in the Engine Coolant Temperature (ECT) Sensor - Intermittent fault in the Engine Coolant Temperature (ECT) Sensor - Faulty Engine Coolant Temperature (ECT) Sensor connector - Faulty Engine Coolant Temperature (ECT) Sensor
FMI 10	Abnormal rate of change	The Engine Coolant Temperature (ECT) Sensor output is showing a constant value	May affect vehicle driveability	- Faulty Engine Coolant Temperature (ECT) Sensor harness - Engine Coolant Temperature (ECT) Sensor failure

MID 128 PID 111 Coolant Level

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 1	Data valid but below normal operational range	- Moderately below range - Critically below range - Short Circuit -, Measuring line	Engine derate	- Coolant level below range - Faulty harness - Engine shutdown
FMI 3	Voltage above normal or shorted to high source	Short Circuit + Measuring line	Coolant level can not be detected	Faulty harness
FMI 4	Voltage below normal or shorted low	Short Circuit -, Measuring line	Coolant level can not be detected	Faulty harness
FMI 5	Current below normal or open circuit	Open Circuit	Coolant level can not be detected	Faulty harness

MID 128 PID 153 Crankcase Pressure

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	Data valid but above normal operational range	- Out of range, max voltage, illegal - Critically Above Range	- Forced idle - Engine shut down	The non-filtered pressure difference (between crankcase pressure and ambient air pressure) is/was above limit. (The fault code will remain during the entire driving cycle (unless reset)
FMI 1	Data valid but below normal operational range	Out of range, min voltage, illegal	N/A	Crankcase Pressure Sensor out of range
FMI 2	Data erratic, intermittent or incorrect	Plausibility	N/A	The crankcase pressure is showing either too high or too low value (abnormal value)
FMI 3	Voltage above normal or shorted to high source	- Short Circuit +, Measuring line - Open Circuit, Ground line	N/A	- Crankcase Pressure 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	N/A	- Crankcase Pressure Sensor failure - Faulty harness

MID 128 PID 171 Ambient Temperature

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 9	Abnormal Update Rate	This fault will become active when the Engine Management System (EMS) Module detects that the Ambient Air Temperature message from the Instrument Cluster Module does not exist.	Malfunction indicator lamp illuminated	Faulty Ambient Air Temperature Sensor harness

MID 128 PID 173 Exhaust Temperature

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	Data valid but above normal operational range — most severe level	Exhaust Gas Temperature is too high	- Engine derate - Poor driveability	- Faulty Exhaust Gas Temperature (EGT) system - Faulty harness or connector
FMI 2	Data erratic, intermittent or incorrect	Sensor is not rational	Poor driveability	- Harness connected to incorrect sensor - Sensor failure
FMI 4	Voltage below normal or shorted low	Short to ground on the metering side of the circuit	Poor driveability	- Sensor failure - Faulty harness
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	Poor driveability	- Faulty harness - Sensor failure
FMI 10	Abnormal rate of change	Sensor is stuck	Poor driveability	Sensor failure

MID 128 PID 175 Engine Oil Temperature

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	Data valid but above normal operational range	- Moderately Above range - Critically Above Range	Engine derate	Extreme driving conditions
FMI 2	Data erratic, intermittent or incorrect	Plausibility	In some cases may have an effect on driveability	The oil temperature sensor output is showing either too high or to low value (abnormal value)
FMI 4	Voltage below normal or shorted low	Short Circuit -, Measuring line	N/A	- Engine Oil Temperature (EOT) sensor failure - Faulty harness
FMI 5	Current below normal or open circuit	- Short Circuit +, Measuring line - Open Circuit	N/A	- Engine Oil Temperature (EOT) sensor failure - Faulty harness

MID 128 PID 354 Relative Humidity

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	Voltage above normal or shorted to high source	- Short to battery in the metering circuit of the Relative Humidity Sensor - Open in the ground circuit of the Relative Humidity Sensor	- Turbocharger noise - Malfunction indicator lamp illuminated	- Faulty connector - Faulty Relative Humidity Sensor harness - Faulty Relative Humidity Sensor
FMI 5	Current below normal or open circuit	- Open in the metering circuit of the Relative Humidity Sensor - Open in the 5 volt supply circuit of the Relative Humidity Sensor - Short to ground in the metering circuit of the Relative Humidity Sensor	- Turbocharger noise - Malfunction indicator lamp illuminated	- Faulty connector - Faulty Relative Humidity Sensor harness - Faulty Relative Humidity Sensor

MID 128 PID 411 EGR Exhaust Back Pressure

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 2	Data erratic, intermittent or incorrect	EGR differential pressure sensor output is too high or too low	- Uneven running - Engine derate	- Faulty EGR Differential Pressure Sensor connector - Faulty EGR Differential Pressure Sensor harness - Faulty EGR Differential Pressure Sensor - EGR leakage - Clogged EGR cooler - Clogged EGR venturi
FMI 3	Voltage above normal or shorted to high source	- Short to battery in metering line - Open in the ground circuit	- Engine responds poorly - 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	- Engine responds poorly - Engine derate	- Faulty EGR Differential Pressure Sensor connector - Faulty EGR Differential Pressure Sensor harness - Faulty EGR Differential Pressure Sensor

MID 128 PID 412 EGR Temperature

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	Data valid but above normal operational range — most severe level	N/A	Malfunction indicator lamp illuminated	- Extreme driving conditions - EGR cooler failure
FMI 4	Voltage below normal or shorted low	Short to ground on the metering side of the EGR Sensor circuit	- Engine responds poorly - 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	- Engine responds poorly - Engine derate	- Faulty EGR Temperature Sensor connector - Faulty EGR Temperature Sensor harness - Faulty EGR Temperature Sensor
FMI 10	Abnormal rate of change	EGR sensor is showing a constant value that will not change	Malfunction indicator lamp illuminated	- Faulty EGR Temperature Sensor connector - Faulty EGR Temperature Sensor harness - EGR system leakage

MID 128 PPID 35 EGR Mass Flow

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	Data valid but above normal operational range — most severe level	EGR flow is too high	Poor driveability	- Faulty EGR system - Faulty harness or connector
FMI 1	Data valid but below normal operational range — most severe level	EGR flow is too low	Poor driveability	- Faulty EGR system - Clogged EGR cooler - Faulty harness or connector

MID 128 PPID 89 Variable Geometry Turbocharger Smart Remote Actuator Temperature

Type of fault	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause
FMI 0	Data valid but above normal operational range-most severe level	VGT SRA temperature is moderately too high	Engine derate	- Coolant system malfunction - Extreme driving conditions - Overheated VGT actuator

MID 128 PPID 122 Engine Compression Brake

Type of fault	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause
FMI 1	Data valid but above normal operational range	Below range	No Volvo Compression Brake (VCB)	Low engine oil temperature
FMI 3	Voltage above normal or shorted to high source	Short Circuit +	- Volvo Compression Brake (VCB) can not be turned on - Engine brake function derated - Gear shift performance derated for some automatic transmission boxes	- Faulty Volvo Compression Brake (VCB) actuator - Faulty harness
FMI 4	Voltage below normal or shorted low	Short Circuit -	- Volvo Compression Brake (VCB) can not be turned off - Engine stops running - Engine impossible to restart	- Faulty Volvo Compression Brake (VCB) actuator - Faulty harness
FMI 5	Current below normal or open circuit	Open Circuit	- Volvo Compression Brake (VCB) can not be turned on - Engine brake function derated - Gear shift performance derated for some automatic transmission boxes	- Faulty Volvo Compression Brake (VCB) actuator - Faulty harness

MID 128 PPID 270 NOx Sensor

MID 233 Fault code sent by MID 128 Engine control unit.

Type of fault	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause
FMI 2	Data erratic, intermittent or incorrect	- Removed - Plausibility	Malfunction indicator lamp illuminated	- NOx sensor removed (measures surround air) - Exhaust system leakage - Air intake leakage - Faulty NOx sensor
FMI 3	Voltage above normal or shorted to high source	Short Circuit, NOx signal	N/A	- Faulty cabling between NOx sensor and NOx sensor ECU - Faulty NOx sensor
FMI 5	Current below normal or open circuit	Open Circuit, NOx signal	N/A	- Faulty cabling between NOx sensor and NOx sensor ECU - Faulty NOx sensor
FMI 9	Abnormal update rate (missing sensor signal)	Abnormal update	N/A	Missing signal from NOx sensor
FMI 10	Abnormal rate of change	Stuck	N/A	- Exhaust system leakage - Air intake leakage - Faulty NOx sensor
FMI 12	Bad Intelligent Device or Component	Incorrect value	N/A	Faulty NOx sensor
FMI 13	Out of calibration	Range check	N/A	Faulty NOx sensor
FMI 14	Special instructions	Missing signal from sensor due to battery voltage	N/A	Voltage to NOx sensor is too high

MID 128 PPID 272 Air Pressure Compensation

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 4	Voltage below normal or shorted to low source	Short Circuit -	Possible turbo noise	- Faulty Intake Air Temperature and Humidity (IATH) sensor - Faulty harness - Faulty Intake Air Temperature and Humidity (IATH) sensor connector
FMI 5	Current below normal or open circuit	- Short Circuit + - Open Circuit	Possible turbo noise	- Faulty Intake Air Temperature and Humidity (IATH) sensor - Faulty harness - Faulty Intake Air Temperature and Humidity (IATH) sensor connector

MID 128 PPID 326 Soot Level

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	Data valid but above normal operational range	Moderately high soot load	Medium to high engine derate	- Diesel Particulate Filter (DPF) clogged - After Treatment Fuel Injector clogged - Regeneration disabled by driver or other component
FMI 11	Critically high soot load	Critically high soot load	- High engine derate - Engine derate	- Diesel Particulate Filter (DPF) clogged - After Treatment Fuel Injector clogged - Regeneration disabled by driver or other component

MID 128 PPID 328 Aftertreatment Injection Shutoff Valve

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	Malfunction indicator lamp illuminated	- Faulty harness - Actuator failure
FMI 4	Voltage below normal or shorted low	Circuit shorted to ground	Malfunction indicator lamp illuminated	- Faulty harness - Actuator failure
FMI 5	Current below normal or open circuit	Open circuit	Malfunction indicator lamp illuminated	- Faulty harness - Actuator failure
FMI 7	Mechanical system not responding or out of adjustment	After Treatment Fuel Injector stuck closed	Malfunction indicator lamp illuminated	Shut off valve stuck closed
FMI 14	Special instructions	After Treatment Fuel Injector leaking	Malfunction indicator lamp illuminated	After Treatment Fuel Injector failure

MID 128 PPID 329 Aftertreatment Fuel Injector

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	Malfunction indicator lamp illuminated	- Faulty harness - Injector failure
FMI 4	Voltage below normal or shorted low	Circuit shorted to ground	Malfunction indicator lamp illuminated	- Faulty harness - Injector failure
FMI 5	Current below normal or open circuit	Open circuit	Malfunction indicator lamp illuminated	- Faulty harness - Injector failure
FMI 7	Mechanical system not responding or out of adjustment	After treatment fuel injector clogged	Malfunction indicator lamp illuminated	After Treatment Fuel Injector failure
FMI 14	Special instructions	After Treatment Fuel Injector leaking	Malfunction indicator lamp illuminated	After Treatment Fuel Injector failure

MID 128 PPID 330 DRV

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	Voltage above normal or shorted to high source	Short circuit +	- On/off valve can't be activated - Regeneration not possible - High engine braking without request - Driveability affected	- Faulty Discharge Recirculator Valve (DRV) Solenoid - Faulty harness - Faulty Discharge Recirculator Valve (DRV) Solenoid connector
FMI 4	Voltage below normal or shorted low	Short circuit-	- Valve constantly activated - Major engine derate - Exhaust manifold overheating - Engine shut down	- Faulty Discharge Recirculator Valve (DRV) Solenoid - Faulty harness - Faulty Discharge Recirculator Valve (DRV) Solenoid connector
FMI 5	Current below normal or open circuit	Open circuit	- On/off valve can't be activated - Regeneration not possible - High engine braking without request - Driveability affected	- Faulty Discharge Recirculator Valve (DRV) Solenoid - Faulty harness - Faulty Discharge Recirculator Valve (DRV) Solenoid connector
FMI 7	Mechanical system not responding or out of adjustment	Mechanically Stuck	- On/off valve can't be activated - Regeneration not possible - High engine braking without request - Driveability affected - Valve constantly activated - Major engine derate - Exhaust manifold overheating - Engine shut down	- Leaking pipes - Faulty Discharge Recirculator Valve (DRV) Solenoid

MID 128 PPID 337 Ash Level

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	Data valid but above normal operational range	Ash level too high	Need service	Short intervals between filter regenerations

MID 128 PPID 387 Temperature Sensor, Catalytic Converter

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 2	Data erratic, intermittent or incorrect	Sensor is not rational	Poor driveability	- Harness connected to incorrect sensor - Sensor failure
FMI 4	Voltage below normal or shorted low	Short to ground on the metering side of the circuit	Poor driveability	- Faulty harness - Sensor failure
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	Poor driveability	- Faulty harness - Actuator failure
FMI 10	Abnormal rate of change	Sensor is stuck	Poor driveability	Sensor failure

MID 128 PPID 436 Exhaust Gas Temperature Sensor 3

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 2	Data erratic, intermittent or incorrect	Sensor is not rational	Poor driveability	- Harness connected to incorrect sensor - Sensor failure
FMI 4	Voltage below normal or shorted low	Short to ground on the metering side of the circuit	Poor driveability	- Faulty harness - Sensor failure
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	Poor driveability	- Faulty harness - Actuator failure
FMI 10	Abnormal rate of change	Sensor is stuck	Poor driveability	Sensor failure

MID 128 PPID 437 Aftertreatment Injector Fuel Pressure Sensor

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 2	Data erratic, intermittent or incorrect	Sensor is not rational	N/A	- Faulty shut off valve - Sensor failure
FMI 3	Voltage above normal or shorted to high source	- Short to battery on the metering side - Open in the ground line	N/A	- Faulty harness - Sensor failure
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	N/A	- Faulty harness - Sensor Failure
FMI 10	Abnormal rate of change	After treatment injector fuel pressure sensor stuck	N/A	- Sensor - Faulty shut off valve - Injector failure

MID 128 PSID 47 Particulate Trap Regeneration

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	Data valid but above normal operational range	Plausability, too high	Regeneration not possible	Faulty After Treatment Injector
FMI 1	Data valid but below normal operational range	Plausability, too low	Regeneration not possible	- Faulty After Treatment Injector - Faulty Diesel Particulate Filter (DPF) catalyst
FMI 8	Abnormal frequency, pulse width or period	Regeneration period too long	N/A	N/A
FMI 12	Bad Intelligent Device or Component	Regeneration efficiency too low	N/A	- Clogged After Treatment Injector - Diesel Particulate Filter (DPF) catalyst damaged - Diesel Particulate Filter (DPF) catalyst clogged

MID 128 PSID 98 Boost Air System

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	Data valid but above normal operational range — most severe level	Boost pressure is too high	Turbocharger surge	- EGR system failure - Faulty turbocharger actuator
FMI 1	Data valid but below normal operational range — most severe level	Boost pressure is too low	- Engine derate - Engine slow to respond	Faulty Boost Air System hoses, pipes, brackets, cooler, EGR system components and turbo components

MID 128 PSID 108 Aftertreatment Injection System

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 7	• Mechanical system not responding, or out of adjustment	• Mechanical problem	• Regeneration not possible • Engine derate • Engine shut down	• Faulty After Treatment Injection (ATI) system

MID 128 PSID 109 Engine Coolant Temperature Sensor

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 7	Thermostat blocked closed	- This fault will become active when the Engine Management System (EMS) Module detects that the Engine Coolant Temperature (ECT) Sensor output is high but still with in the acceptable range for the sensor. - The Coolant Temperature Sensor is indicating a high coolant temperature.	Malfunction indicator lamp illuminated	- Thermostat Blocked Closed - Faulty radiator fan - Clogged radiator
FMI 12	Thermostat blocked open	This fault will become active when the Engine Management System (EMS) Module detects that the Engine Coolant Temperature (ECT) Sensor output is low but still with in the acceptable range for the sensor.	- Poor heat in cab - Malfunction indicator lamp illuminated	Thermostat Blocked Open

MID 128 SID 1/2/3/4/5/6 Unit Injector

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	Voltage high/open	EMS module detects a short circuit to battery on the low side of the Spill Valve (SV)/Needle Control Valve (NCV).	- Loss of power - Uneven running - Running on 3 to 5 cylinders - Malfunction indicator lamp illuminated	Open circuit
FMI 5	Current below normal or open circuit	EMS detects a short circuit to battery positive, a short circuit to ground, or an open circuit on the high side of the SV/Needle Control Valve (NCV) or a Short Circuit to ground on the low side of the SV/NCV.	- Loss of power - Uneven running - Running on 3 to 5 cylinders - Malfunction indicator lamp illuminated	- Harness shorted or open - Faulty fuel injector solenoid
FMI 7	Mechanical system not responding	Cylinder balancing data is above the limit	Erratic engine idle speed	- Clogged fuel injector(s) - Low fuel pressure - Poor Compression - Improper valve adjustment
FMI 12	Failed Device (Low injector hold current)	Injector or harness resistance too high	- Loss of power - Uneven running - Malfunction indicator lamp illuminated	- Injector solenoid resistance out of specification - Harness resistance too high
FMI 14	Special instructions	- Fuel injector flow is too low or high. - Cylinder compression is low.	- Loss of power - Uneven running - Malfunction indicator lamp illuminated	- Low injector flow - High injector flow - Poor compression

MID 128 SID 18 Drain Valve, Water Separator

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	• Valve constantly shut	• Faulty Water In Fuel (WIF) Solenoid Valve • Broken wire
FMI 4	• Voltage below normal or shorted low	• Short Circuit -, Measuring line	• High fuel consumption due to fuel leakage	• Faulty Water In Fuel (WIF) Solenoid Valve • Broken wire
FMI 5	• Current below normal or open circuit	• Open Circuit	• Valve constantly shut	• Faulty Water In Fuel (WIF) Solenoid Valve • Broken wire

MID 128 SID 21 Engine Position Timing Sensor

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 2	Data erratic, intermittent or incorrect	Phase Error - Incorrect correlation between CAM and Crank Sensor	Increased fuel consumption	- Faulty connector - Faulty Engine Position Timing Sensor harness - Faulty Engine Position Timing Sensor - Improper air gap
FMI 3	Voltage above normal, or shorted to high source	- Missing Signal from Engine Position Timing Sensor - Open in the Engine Position Timing Sensor Circuit - Short to battery in the Engine Position Timing Sensor Circuit - Short to ground in the Engine Position Timing Sensor Circuit	- Increased engine start time - Loss of engine power	Faulty Engine Position Timing Sensor harness
FMI 8	Abnormal frequency, pulse width or period	- Noisy Signal from Engine Position Timing Sensor - Open in the Engine Position Timing Sensor Circuit	- Increased engine start time - Loss of engine power	- Faulty Engine Position Timing Sensor harness - Faulty Engine Position Timing Sensor mounting

MID 128 SID 22 Engine Speed Sensor

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 2	Data erratic, intermittent or incorrect	Intermittent or weak signal	- Increased fuel consumption - Imprecise engine timing - Increased fuel consumption - Uneven cylinder balancing - Power loss - Smoke	- Faulty connector - Faulty Engine Speed Sensor harness - Faulty Engine Speed Sensor - Improper air gap
FMI 3	Voltage above normal, or shorted to high source	- Missing Signal from Engine Speed Sensor - Open in the Engine Speed Sensor Circuit - Short to battery in the Engine Speed Sensor Circuit - Short to ground in the Engine Position Timing Sensor Circuit	- Increased engine start time - Vehicle may be in limp home mode - Loss of engine power	- Faulty Engine Speed Sensor harness - Faulty Crank Sensor mounting
FMI 8	Abnormal frequency, pulse width or period	- Erratic or intermittent signal from Engine Speed Sensor - Open in the Engine Speed Sensor	- Increased fuel consumption - Imprecise engine timing - Increased fuel consumption - Uneven cylinder balancing - Power loss - Smoke	- Faulty Engine Speed Sensor harness - Faulty Engine Speed Sensor mounting

MID 128 SID 27 Variable Geometry Turbocharger

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 2	Data erratic, intermittent or incorrect	- Smart remote actuator has not seen a valid command on CAN2 - Incorrect data	- Low boost - Low power - Nozzle opens - Smoke from engine	Disturbance on CAN2 data lines
FMI 4	Voltage below normal, or shorted to low source	Short to ground	- Nozzle will open resulting in low power and low boost - SRA will continue to attempt and maintain target nozzle position	- Faulty SRA VGT connector - Faulty SRA VGT harness - Low battery voltage
FMI 7	Mechanical system not responding or out of adjustment	Mechanical problem with the VGT SRA	- Low boost and smoke - Possible engine derate - Power loss in some cases when actuator motor has been disabled	- Actuator motor effort is temporarily limited to prevent overheating - Restrictions detected when running learn sequence - SRA is slow to follow commands - SRA position is not tracking command
FMI 9	Abnormal update rate	Data from the SRA has been missing for 2-seconds	- Engine derated (major) - EGR valve closed	- Data line harness - No supply to VGT actuator - VGT actuator - VGT SRA connector
FMI 13	Out of calibration	Failed self-calibration	N/A	Smart remote actuator

MID 128 SID 33 Fan Control

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	Malfunction indicator lamp illuminated	- Broken 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	Malfunction indicator lamp illuminated	- Broken 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	Malfunction indicator lamp illuminated	- Broken Cooling Fan Actuator - Faulty Cooling Fan Actuator harness or connector

MID 128 SID 70 Preheater Element 1

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	Fuse for shorting wire blown	- Faulty Preheat Relay - Short in high side of Preheat Sense 1 circuit
FMI 4	Voltage below normal or shorted low	Short Circuit -, Measuring line	Shorting wire may break	- Preheat relay problem - Sense 1, Short Circuit -, Measuring line
FMI 5	Current below normal or open circuit	Open Circuit	May get start problems in cold climate	- Faulty Heating element - Broken wire

MID 128 SID 71 Preheater Element 2

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	Fuse for shorting wire blown	- Faulty Preheat Relay - Short in high side of Preheat Sense 2circuit
FMI 4	Voltage below normal or shorted low	Short Circuit -, Measuring line	Shorting wire may break	- Preheat relay problem - Sense 2, Short Circuit -, Measuring line
FMI 5	Current below normal or open circuit	Open Circuit	May get start problems in cold climate	- Faulty Heating element - Broken wire

MID 128 SID 146 EGR Valve 1

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	Voltage above normal, or shorted To high source	- Stuck EGR Control Valve - EGR Control Valve circuit shorted to positive - EGR Control Valve circuit shorted to ground	- Malfunction indicator lamp illuminated - Engine derate	- Faulty EGR Control Valve actuator - EGR Control Valve harness
FMI 5	Current below normal or open circuit	Open EGR Control Valve Circuit	- Malfunction indicator lamp illuminated - Engine derate	- Faulty EGR Control Valve actuator - EGR Control Valve harness
FMI 7	Mechanical System Not Responding or Out Of Adjustment	EGR Valve stuck closed	Engine derate	Faulty EGR Valve
FMI 12	Bad Intelligent Device or Component	EGR Valve stuck open	Engine derate	Faulty EGR Valve

MID 128 SID 211 5 Volt DC Supply

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	Voltage above normal, or shorted To high source	N/A	- Strange information displayed on cluster - Poor driveability	5 volt reference circuit shorted to positive - Faulty harness or connector - Faulty sensor power supply - MID 128 PID's 94, 100 and 153 may also be set
FMI 4	Voltage Below Normal, or Shorted To Low Source	N/A	- Strange information displayed on cluster - Poor driveability	5 volt reference circuit shorted to ground - Faulty harness or connector - Faulty sensor power supply - MID 128 PID's 94, 100 and 153 may also be set

MID 128 SID 230 Idle Validation Switch 1

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	No IVS limp home function for pedal position	- Faulty connector - Faulty VECU - Short to voltage in signal circuit harness
FMI 5	Current Below Normal or Open Circuit	IVS signal shorted to ground or open	No IVS limp home function for pedal position	- Faulty connector - Faulty VECU - Short to ground or open in signal circuit harness

MID 128 SID 232 5 Volt DC Supply to Sensor

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	Voltage above normal, or shorted to high source	N/A	- Strange information displayed on cluster - Poor driveability	- Poor driveability - Faulty harness or connector - Faulty sensor power supply - MID 128 PID's 26, 102 and 411 may also be set
FMI 4	Voltage below normal or shorted to low source	N/A	- Strange information displayed on cluster - Poor driveability	5 volt reference circuit shorted to ground - Faulty harness or connector - Faulty sensor power supply - MID 128 PID's 26, 102 and 411 may also be set

Transmission Control Unit, Fault Tracing

The "Premium Tech Tool" (PTT) is the preferred tool for performing diagnostic work. Contact your local dealer for more information.

The control units on the information link communicate according to the SAE J1587 standard. The standard has been extended with Volvo's own supplement (PPID, PSID). The fault codes set by the control units contain information that is described by the following abbreviations.

MID	Message Identification Description: Identification of a control unit.	SID	Subsystem Identification Description: Identification of a component.
PID	Parameter Identification Description: Identification of a parameter (value).	PSID	Proprietary Subsystem Identification Description Volvo: Unique identification of a component.
PPID	Proprietary Parameter Identification Description Volvo: Unique identification of a parameter (value).	FMI	Failure Mode Identifier: Identification of fault types.

FMI Table

FMI	Display Text	SAE Text
0	Too high value	Data valid, but above the normal work range
1	Too low value	Data valid, but below the normal work range
2	Incorrect data	Data erratic, Intermittent or incorrect
3	Electrical fault	Voltage above normal or shorted high
4	Electrical fault	Voltage below normal or shorted low
5	Electrical fault	Current below normal or open circuit
6	Electrical fault	Current above normal or grounded circuit
7	Mechanical fault	Mechanical system not responding properly
8	Mechanical or electrical fault	Abnormal frequency, pulse width or period
9	Communication fault	Abnormal update rate
10	Mechanical or electrical fault	Abnormal rate of change
11	Unknown fault	Failure mode not identifiable
12	Component fault	Bad intelligent device or component
13	Incorrect calibration	Out of calibration
14	Unknown fault	Special instructions
15	Unknown fault	Reserved for future assignment by SAE Data Formal Subcommittee

Note: When performing diagnostic test on intermittent faults, gently wiggle the wires and connectors to help find the intermittent faults.

MID 130 Control Unit, Fault Tracing

PID

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- “MID 130 PID 33 Clutch Cylinder, Position” page 59
- “MID 130 PID 36 Clutch Wear, Status” page 61
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PPID

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PSID

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SID

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MID 130 PID 31 Range Cylinder, Position

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	Voltage above normal, or shorted to high source	Status from ASIC is short circuit to U-BATT	- Slow gear changes - Yellow lamp is sent	N/A
FMI 5	Current below normal or open circuit	Status from ASIC is open circuit	- Yellow lamp is sent - Slow gear changes	N/A
FMI 6	Current above normal or grounded circuit	Status from ASIC is short circuit to ground	- Yellow lamp is sent - Slow gear changes	N/A
FMI 13	Calibration value out of range	The checksum in NVRAM is not correct or, the sensor has not been calibrated.	- Yellow lamp is sent - Cranking is inhibited - Engine cannot start	N/A

MID 130 PID 32 Split Cylinder, Position

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	Voltage above normal, or shorted to high source	Status from ASIC is short circuit to U-BATT	- Slow gear changes - Yellow lamp is sent	N/A
FMI 5	Current below normal or open circuit	Status from ASIC is open circuit	- Yellow lamp is sent - Slow gear changes	N/A
FMI 6	Current above normal or grounded circuit	Status from ASIC is short circuit to ground	- Yellow lamp is sent - Slow gear changes	N/A
FMI 13	Calibration value out of range	The checksum in NVRAM is not correct or, the sensor has not been calibrated.	- Yellow lamp is sent - Cranking is inhibited - Engine cannot start	N/A

MID 130 PID 33 Clutch Cylinder, Position

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 2	Data erratic, intermittent, or incorrect	The difference between clutch positions indicated by the sensor signal (SEPoC) and the inverted sensor signal (SEPoCINV) is too large and both signals are within normal range	- Yellow lamp is sent - Slow clutch performance - Rough shifting at start and at slow speed - Slow gear changes	N/A
FMI 3	Voltage above normal, or shorted to high source	Sensor signal is short circuit to UBATT or sensor supply when: at least one of the sensor signals is above normal range	- Yellow lamp is sent - Slow clutch performance - Rough shifting at start and at slow speed - Slow gear changes	N/A
FMI 5	Current below normal or open circuit	- Open circuit on any of the sensor signals is detected when: one of the sensor signals is within normal range and the other sensor signal is below normal range - Open circuit on ground is detected when both the sensor signals are within the normal range and the sum of the sensor signals is above a specific value	- Yellow lamp is sent - Slow clutch performance - Rough shifting at start and at slow speed - Slow gear changes	N/A

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 12	Faulty device or component	Both sensor signals are below normal when: - Status of the sensor ASIC is internal fault on the sensor or - Short circuit to ground on any of the sensor signals or - Open circuit on supply or - Short circuit between the two sensor signals	- Yellow lamp is sent - Slow clutch performance - Rough shifting at start and at slow speed - Slow gear changes	N/A
FMI 13	Calibration value out of range	The checksum in NVRAM is not correct or, the sensor has not been calibrated.	- Yellow lamp is sent - Cranking is inhibited - Engine cannot start	N/A

MID 130 PID 36 Clutch Wear, Status

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	Data valid but above normal operational range	The clutch wear is more than or equal to "SERVICE DUE POSITION"	- Yellow lamp is sent - If active for a long period of time the clutch may completely wear out and fail	N/A

MID 130 PID 37 Air Pressure, Transmission

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	Data valid but above normal operational range	- Sensor signal is in normal range - Pressure is above 145 PSI (10.0 bar)	- Yellow lamp is sent - Slow clutch performance	N/A
FMI 1	Data valid but below operational range	- Sensor signal is in normal range - Pressure is below 72.5 PSI (5.0 bar)	- Yellow lamp is sent - The symbol for compressed air, transmission is sent - Gear changes may be absent - Slow clutch performance	N/A
FMI 3	Voltage above normal or shorted high	The sensor signal is above normal range	Yellow lamp is sent	N/A
FMI 5	Current below normal or open circuit	The sensor signal is below normal range	Yellow lamp is sent	N/A

MID 130 PID 65 Brake Switch

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 14	Special Instructions	The gear lever is moved from neutral or "FOLD" position without prior application of the service brake	- White lamp is sent together with pop up message - The transmission will not engage the selected gear (stays in neutral)	N/A

MID 130 PID 158 Control Unit, Battery Voltage

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	Data valid but above normal operational range	12 Volt System: Voltage is above 19V	Yellow lamp is sent	N/A
FMI 1	Data valid but below operational range	12 Volt System: Voltage is below 9 V and the engine has been running for 5 s	- Yellow lamp is sent - Reduced transmission performance	N/A

MID 130 PID 160 Main Shaft, Rotation Speed

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 1	Data valid but below operational range	- The sensor signal is within normal range and, - The main shaft speed differs from both the value of the countershaft speed and the vehicle speed received from the VECU The following conditions must be fulfilled for a time of 2.0 s in order to activate: - A gear (not neutral) is engaged in the transmission - The value of the input shaft speed calculated from the main shaft speed sensor (SESM) is more than 300 rpm - The value of the input shaft speed calculated from the counter shaft speed sensor (SESC) is more than 300 rpm	- Yellow lamp is sent - Slow gear changes - Rough gear changes	N/A

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 1	(Continued)	• The values of the input shaft speed calculated from the main shaft speed sensor (SESM) and the counter shaft speed sensor (SESC) differ more than 50 rpm • The values of the input shaft speed calculated from the main shaft speed sensor (SESM) and the vehicle speed received from the VECU differ more than 30 rpm • The values of the input shaft speed calculated from the counter shaft speed sensor (SESC) and the vehicle speed received from the VECU differ less than 30 rpm		

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 2	Data erratic, intermittent, or incorrect	- The sensor indicates wrong direction The following conditions must be fulfilled for a time of 2,0 s in order to activate: - The input shaft speed calculated from the countershaft speed sensor (SECS) is above 300 rpm and the clutch is engaged or - The input shaft speed calculated from the countershaft speed sensor (SECS) is above 600 rpm and the clutch position is more engaged than the slip point and the engine speed is received from the engine ECU and above 600 rpm - A forward gear is engaged in the transmission and the mainshaft speed sensor (SESM) indicates reverse movement or - A reverse gear is engaged and the mainshaft speed sensor (SESM) indicates forward movement - There is no other active fault on the sensor for the main shaft speed (SEMS)	- Yellow lamp is sent - Slow gear changes	N/A

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	Voltage above normal or shorted high	Signal or supply voltage is above normal range	- Yellow lamp is sent - Slow gear changes - Rough gear changes	N/A
FMI 4	Voltage below normal or shorted low	Signal and supply voltage is below normal range	- Yellow lamp is sent - Slow gear changes - Rough gear changes	N/A
FMI 5	Current below normal or open circuit	- Signal voltage is below normal range - Supply voltage is in the normal range	- Yellow lamp is sent - Slow gear changes - Rough gear changes	N/A

MID 130 PID 161 Input Shaft, Rotation Speed

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 1	Data valid but below operational range	- The sensor signal is within normal range and, - The counter shaft speed differs from both the main shaft speed (SESM) and the vehicle speed received from the VECU when the counter shaft is rotating The following conditions must be fulfilled for a time of 2.0 s in order to activate: - A gear (not neutral) is engaged in the transmission - The value of the input shaft speed calculated from the main shaft speed sensor (SESM) is more than 300 rpm - The value of the input shaft speed calculated from the counter shaft speed sensor (SESC) is more than 300 rpm	- Yellow lamp is sent - Slow gear changes - Transmission brake up-shifts cannot be used - Engagement point not functioning properly - Starting gear can only be engaged when the vehicle is stationary or when the vehicle speed is high enough to synchronize the transmission with the engine	N/A

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 1	(Continued)	- The values of the input shaft speed calculated from the counter shaft speed sensor (SESC) and the main shaft speed sensor (SESM) differ more than 50 rpm - The values of the input shaft speed calculated from the counter shaft speed sensor (SESC) and the vehicle speed received from the VECU differ more than 30 rpm - The values of the input shaft speed calculated from the main shaft speed sensor (SESM) and the vehicle speed received from the VECU differ less than 30 rpm		

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 4	Voltage below normal or shorted low	The sensor signal is below normal range	- Yellow lamp is sent - Slow gear changes - Transmission brake up-shifts cannot be used - Engagement point not functioning properly - Starting gear can only be engaged when the vehicle is stationary or when the vehicle speed is high enough to synchronize the transmission with the engine	N/A
FMI 5	Current below normal or open circuit	The sensor signal is above normal range	- Yellow lamp is sent - Slow gear changes - Transmission brake up-shifts cannot be used - Engagement point not functioning properly - Starting gear can only be engaged when the vehicle is stationary or when the vehicle speed is high enough to synchronize the transmission with the engine	N/A

MID 130 PID 177 Oil Temperature, Transmission

Note: FMI 0 has three levels of severity, low, medium and high. All times are reset when the key is switched off.

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0 (Low)	Data valid but above normal operational range	- The sensor signal is in normal range - Temperature is above 100°C (212°F) during 18000 s	- Yellow lamp is sent - Symbol for high transmission oil temperature is lit	N/A
FMI 0 (Medium)	Data valid but above normal operational range	- The sensor signal is in normal range - Temperature is above 120°C (248°F) during 600 s	- Yellow lamp is sent - Symbol for high transmission oil temperature is lit	N/A
FMI 0 (High)	Data valid but above normal operational range	- The sensor signal is in normal range - Temperature is above 140 °C (284°F) during 30 s	- Red lamp is sent - Symbol for high transmission oil temperature is lit	N/A
FMI 4	Voltage below normal or shorted low	The sensor signal is below normal range	Yellow lamp is sent	N/A
FMI 5	Current below normal or open circuit	The sensor signal is above normal range	Yellow lamp is sent	N/A

MID 130 PPID 10 Gear Selector Cylinder 1, Position

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	Voltage above normal or shorted high	Status from ASIC is short circuit to U-BATT	- Yellow lamp is sent - Slow gear changes	N/A
FMI 5	Current below normal or open circuit	Status from ASIC is open circuit	- Yellow lamp is sent - Slow gear changes	N/A
FMI 6	Current above normal or grounded circuit	Status from ASIC is short circuit to ground	- Yellow lamp is sent - Slow gear changes	N/A
FMI 13	Calibration value out of range	- The checksum in NVRAM is not correct or - The sensor has not been calibrated	- Yellow lamp is sent - Cranking is inhibited - Engine cannot start	N/A

MID 130 PPID 11 Gear Selector Cylinder 2, Position

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	Voltage above normal or shorted high	Status from ASIC is short circuit to U-BATT	- Yellow lamp is sent - Slow gear changes	N/A
FMI 5	Current below normal or open circuit	Status from ASIC is open circuit	- Yellow lamp is sent - Slow gear changes	N/A
FMI 6	Current above normal or grounded circuit	Status from ASIC is short circuit to ground	- Yellow lamp is sent - Slow gear changes	N/A
FMI 13	Calibration value out of range	- The checksum in NVRAM is not correct or - The sensor has not been calibrated	- Yellow lamp is sent - Cranking is inhibited - Engine cannot start	N/A

MID 130 PPID 50 Clutch, Pre-load

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	Data valid but above normal operational range	- The calculated stored energy is above 200 kJ - The energy calculation is time based for VTNA and physical for others	- Yellow lamp is sent - The clutch is overheated - The clutch is slowly engaged	N/A
FMI 11	Clutch protection active (unidentifiable error)	Clutch slip more than 8.0 s with vehicle movement less than 0.8 m (e.g. hill holding event)	- Yellow lamp is sent - There has been unnecessary clutch slip - The clutch is slowly engaged	N/A
FMI 14	Special instructions	Attempt to start in high range in manual position	- White lamp is sent - Not possible to start	N/A

MID 130 PPID 51 Clutch Disc, Pull Position

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 13	Calibration value out of range	- The checksum in NVRAM is not correct - The slip point has not been calibrated	- Yellow lamp is sent - It is not possible to drive the vehicle	N/A

MID 130 PPID 54 ECU +5V Output

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	Data valid but above normal operational range	Voltage is above normal range	- Yellow lamp is sent - Slow clutch performance - Uneven shifting at start and at slow speed - Slow gear changes	N/A
FMI 1	Data valid but below operational range	Voltage is below normal range	- Yellow lamp is sent - Slow clutch performance - Uneven shifting at start and at slow speed - Slow gear changes	N/A

MID 130 PPID 55 ECU, Temperature

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	Data valid but above normal operational range	Temperature is above 125°C (257°F)	Yellow lamp is sent	N/A

MID 130 PPID 140 Inclination Angle

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 2	Data erratic, intermittent, or incorrect	- The sensor signal is above or below normal range - The vehicle has been standing still for a specific time	- Yellow lamp is sent - The start gear may be wrong - Gear selection performance might be reduced - Downhill and uphill gear change performance may be reduced	N/A

MID 130 PSID 1 PWM Valve, Quick Engagement

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	Voltage above normal or shorted high	- The high-side drive is short circuit to U-BATT and - There is no active fault code for short circuit to U-BATT on VAF-	- Yellow lamp is sent - Erratic clutch performance - Slow clutch performance - Slow gear changes	N/A
FMI 5	Current below normal or open circuit	The high-side drive is open circuit	- Yellow lamp is sent - Erratic clutch performance - Slow clutch performance - Slow gear changes	N/A
FMI 6	Current above normal or grounded circuit	The high-side drive is short circuit to ground	- Yellow lamp is sent - Erratic clutch performance - Slow clutch performance - Slow gear changes	N/A

MID 130 PSID 2 PWM Valve, Slow Engagement

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	Voltage above normal or shorted high	- The high-side drive is short circuit to U-BATT and - There is no active fault code for short circuit to U-BATT on VAS-	- Yellow lamp is sent - Erratic clutch performance - Uneven shifting at start and at slow speed	N/A
FMI 5	Current below normal or open circuit	The high-side drive is open circuit	- Yellow lamp is sent - Erratic clutch performance - Uneven shifting at start and at slow speed	N/A
FMI 6	Current above normal or grounded circuit	The high-side drive is short circuit to ground	- Yellow lamp is sent - Erratic clutch performance - Uneven shifting at start and at slow speed	N/A

MID 130 PSID 3 PWM Valve, Quick Disconnection

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	Voltage above normal or shorted high	- The high-side drive is short circuit to U-BATT and - There is no active fault code for short circuit to U-BATT on VAF-	- Yellow lamp is sent - Erratic clutch performance - Slow clutch performance - Slow gear changes	N/A
FMI 5	Current below normal or open circuit	The high-side drive is open circuit	- Yellow lamp is sent - Erratic clutch performance - Slow clutch performance - Slow gear changes	N/A
FMI 6	Current above normal or grounded circuit	The high-side drive is short circuit to ground	- Yellow lamp is sent - Erratic clutch performance - Slow clutch performance - Slow gear changes	N/A

MID 130 PSID 4 PWM Valve, Slow Disconnection

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	Voltage above normal or shorted high	- The high-side drive is short circuit to U-BATT and - There is no active fault code for short circuit to U-BATT on VAS-	- Yellow lamp is sent - Erratic clutch performance - Uneven shifting at start and at slow speed	N/A
FMI 5	Current below normal or open circuit	The high-side drive is open circuit	- Yellow lamp is sent - Erratic clutch performance - Slow clutch performance	N/A
FMI 6	Current above normal or grounded circuit	The high-side drive is short circuit to ground	- Yellow lamp is sent - Erratic clutch performance - Slow clutch performance	N/A

MID 130 PSID 5 Ground, Quick PWM Valves

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	Voltage above normal or shorted high	The low-side drive is short circuit to U-BATT	- Yellow lamp is sent - Erratic clutch performance - Slow clutch performance - Slow gear changes	N/A
FMI 6	Current above normal or grounded circuit	- The low-side drive is short circuit to ground and - There is no active fault code for short circuit to ground on VAFE or VAFD	- Yellow lamp is sent - Erratic clutch performance - Slow clutch performance - Slow gear changes	N/A

MID 130 PSID 6 Ground, Slow PWM Valves

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	Voltage above normal or shorted high	The low-side drive is short circuit to U-BATT	- Yellow lamp is sent - Erratic clutch performance - Uneven shifting at start and at slow speed	N/A
FMI 6	Current above normal or grounded circuit	- The low-side drive is short circuit to ground and - There is no active fault code for short circuit to ground on VASE or VASD	- Yellow lamp is sent - Erratic clutch performance - Uneven shifting at start and at slow speed	N/A

MID 130 PSID 12 Solenoid Valve, Gear Selector Cylinder 1, Inner

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	Voltage above normal or shorted high	The high-side drive is short circuit to U-BATT	- Yellow lamp is sent - The valve is activated - Incorrect gear selection	N/A
FMI 5	Current below normal or open circuit	The high-side drive is open circuit	- Yellow lamp is sent - The valve cannot be activated - Incorrect gear selection	N/A
FMI 6	Current above normal or grounded circuit	The high-side drive is short circuit to ground	- Yellow lamp is sent - The valve cannot be activated - Incorrect gear selection	N/A

MID 130 PSID 13 Solenoid Valve, Gear Selector Cylinder 1, Outer

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	• Voltage above normal or shorted high	• The high-side drive is short circuit to U-BATT	• Yellow lamp is sent • The valve is activated • Incorrect gear selection	• N/A
FMI 5	• Current below normal or open circuit	• The high-side drive is open circuit	• Yellow lamp is sent • The valve cannot be activated • Incorrect gear selection	• N/A
FMI 6	• Current above normal or grounded circuit	• The high-side drive is short circuit to ground	• Yellow lamp is sent • The valve cannot be activated • Incorrect gear selection	• N/A

MID 130 PSID 14 Solenoid Valve, Gear Selector Cylinder 2, Inner

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	Voltage above normal or shorted high	The high-side drive is short circuit to U-BATT	- Yellow lamp is sent - The valve is activated - Incorrect gear selection	N/A
FMI 5	Current below normal or open circuit	The high-side drive is open circuit	- Yellow lamp is sent - The valve cannot be activated - Incorrect gear selection	N/A
FMI 6	Current above normal or grounded circuit	The high-side drive is short circuit to ground	- Yellow lamp is sent - The valve cannot be activated - Incorrect gear selection	N/A

MID 130 PSID 15 Solenoid Valve, Gear Selector Cylinder 2, Outer

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	• Voltage above normal or shorted high	• The high-side drive is short circuit to U-BATT	• Yellow lamp is sent • The valve cannot be activated • Incorrect gear selection	• N/A
FMI 5	• Current below normal or open circuit	• The high-side drive is open circuit	• Yellow lamp is sent • The valve cannot be activated • Incorrect gear selection	• N/A
FMI 6	• Current above normal or grounded circuit	• The high-side drive is short circuit to ground	• Yellow lamp is sent • The valve cannot be activated • Incorrect gear selection	• N/A

MID 130 PSID 20 Solenoid Valve, Power Take-off 1

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	Voltage above normal or shorted high	The high-side drive is short circuit to U-BATT	- Yellow lamp is sent - The valve is activated - The PTO cannot be deactivated - Rough gear changes	N/A
FMI 5	Current below normal or open circuit	The high-side drive is open circuit	- Yellow lamp is sent - The valve cannot be activated - The PTO does not work	N/A
FMI 6	Current above normal or grounded circuit	The high-side drive is short circuit to ground	- Yellow lamp is sent - The valve cannot be activated - The PTO does not work	N/A

MID 130 PSID 21 Solenoid Valve, Power Take-off 2

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	Voltage above normal or shorted high	The high-side drive is short circuit to U-BATT	- Yellow lamp is sent - The valve is activated - The PTO cannot be deactivated - Rough gear changes	N/A
FMI 5	Current below normal or open circuit	The high-side drive is open circuit	- Yellow lamp is sent - The valve cannot be activated - The PTO does not work	N/A
FMI 6	Current above normal or grounded circuit	The high-side drive is short circuit to ground	- Yellow lamp is sent - The valve cannot be activated - The PTO does not work	N/A

MID 130 PSID 22 Solenoid Valve, Brake, Counter Shaft

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	Voltage above normal or shorted high	The high-side drive is short circuit to U-BATT	- Red lamp is sent - The valve and the brake are activated - The transmission will be damaged if the vehicle drives - The propshaft has to be removed to move the vehicle	N/A
FMI 5	Current below normal or open circuit	The high-side drive is open circuit	- Yellow lamp is sent - The valve cannot be activated - Slow gear changes	N/A
FMI 6	Current above normal or grounded circuit	The high-side drive is short circuit to ground	- Yellow lamp is sent - The valve cannot be activated - Slow gear changes	N/A

MID 130 PSID 23 Split Engagement System

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	Unintentional disengagement of indirect split	- Low split jumps out - The split cylinder valves are inactive	- Yellow lamp is sent - Loss of torque	N/A
FMI 1	Unintentional disengagement of direct split	- High split jumps out - The split cylinder valves are inactive	- Yellow lamp is sent - Loss of torque	N/A
FMI 2	Unintentional disengagement of neutral split	- The split cylinder position leaves the neutral position - The split cylinder valves are inactive	Yellow lamp is sent	N/A
FMI 7	Blocked engagement of neutral split	The neutral split gear cannot engage	- Yellow lamp is sent - Eco roll not available	N/A

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 11	Blocked engagement of indirect split	The indirect split gear can not engage	- Yellow lamp is sent - Loss of torque - Incorrect gear selection - Slow gear changes	N/A
FMI 12	Blocked engagement of direct split	The direct split gear can not engage	- Yellow lamp is sent - Loss of torque - Incorrect gear selection - Slow gear changes	N/A

MID 130 PSID 24 Range Engagement System

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	Unintentional disengagement of low range	- The range cylinder leaves the low range position - The range cylinder valves are inactive	- Yellow lamp is sent - Loss of torque	N/A
FMI 1	Unintentional disengagement of high range	- The range cylinder leaves the high range position - The range cylinder valves are inactive	- Yellow lamp is sent - Loss of torque	N/A
FMI 11	Blocked engagement of low range	The low range gear can not engage	- Yellow lamp is sent - Loss of torque - Incorrect gear selection	N/A
FMI 12	Blocked engagement of high range	The high range gear can not engage	- Yellow lamp is sent - Loss of torque - Incorrect gear selection	N/A

MID 130 PSID 25 Gears 1/R Engagement System

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	Unintentional disengagement of first gear	- The 1/R cylinder leaves the 1:st position - The 1:st cylinder valves are inactive	- Yellow lamp is sent - Loss of torque	N/A
FMI 1	Unintentional disengagement of reverse gear	- The 1/R gear leaves the reverse position - The 1/R cylinder valves are inactive	- Yellow lamp is sent - Loss of torque	N/A
FMI 2	Unintentional disengagement of neutral	- The 1/R cylinder leaves the neutral position - The 1/R cylinder valves are inactive	Yellow lamp is sent	N/A
FMI 7	Blocked engagement of neutral	Not possible to engage neutral	- Yellow lamp is sent - Slow gear changes	N/A

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 11	Blocked engagement of first gear	- The 1:st gear can not engage and, - There is no active fault code on the SEPo1R and, - There is no active fault code for low air pressure and, - There is no active fault code on any of the 1:st and reverse gear cylinder valves	- Yellow lamp is sent - Loss of torque - Incorrect gear selection - The 1:st gears will not be selected by the system for a short while after five successful gearshifts a new attempt to use 1:st gear may be made	N/A
FMI 12	Blocked engagement of reverse gear	The reverse gear cannot engage	- Yellow lamp is sent - The R gear can not engage, but the system will try to engage it as long as the gear lever is in the reverse position	N/A

MID 130 PSID 26 Gears 2/3 Engagement System

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	Unintentional disengagement of second gear	- The 2/3 cylinder position indicates that the 2/3 gear leaves the 2:nd position - The cylinder valves are inactive	- Yellow lamp is sent - Loss of torque	N/A
FMI 1	Unintentional disengagement of third gear	- The 2/3 cylinder leaves the 3:rd position - The 3:rd cylinder valves are inactive	- Yellow lamp is sent - Loss of torque	N/A
FMI 2	Unintentional disengagement of neutral	- The split cylinder position leaves the neutral position - The split cylinder valves are inactive	Yellow lamp is sent	N/A
FMI 7	Blocked engagement of neutral	The neutral gear (2:nd and 3:rd gear cylinder) cannot engage	- Yellow lamp is sent - Slow gear changes	N/A

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 11	Blocked engagement of second gear	The 2:nd gear can not engage	- Yellow lamp is sent - Loss of torque - Incorrect gear selection - The 2:nd gear will not be selected by the system for a short while after five successful gearshifts a new attempt to use 2:nd gear may be made	N/A
FMI 12	Blocked engagement of third gear	The 3:rd gear cannot engage	- Yellow lamp is sent - Loss of torque - Incorrect gear selection - The 3:rd gear will not be selected by the system for a short while after five successful gearshifts a new attempt to use 3:rd gear may be made	N/A

MID 130 PSID 27 Clutch System

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 0	Unintentional disengagement of the clutch	- The clutch disengages when not commanded and, - There is no active fault code on the SEPoC and, - There is no active fault code for low air pressure and, - There is no active fault code on any of the clutch cylinder valves and, - The PCB temperature is above a specific limit	- Yellow lamp is sent - Slow gear changes - Slow clutch performance	N/A
FMI 1	Unintentional engagement of the clutch	- The clutch engages when not commanded and, - There is no active fault code on the SEPoC and - There is no active fault code for low air pressure and - There is no active fault code on any of the clutch cylinder valves and, - The PCB temperature is above a specific limit	- Yellow lamp is sent - Slow gear changes - Erratic clutch performance	N/A

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 7	Mechanical system not responding or out of adjustment	- The clutch does not dis-engage/engage properly when commanded and, - There is no active fault code on the SEPoC and, - There is no active fault code for low air pressure and, - There is no active fault code on any of the clutch cylinder valves and, - The PCB temperature is above 10°C (50°F)	- Yellow lamp is sent - Slow gear changes - Erratic clutch performance	N/A
FMI 11	Clutch drag	The clutch transfers too much torque in the disengaged position	- Yellow lamp is sent - The vehicle tends to creep on flat ground at idle - The clutch wear is high	N/A
FMI 12	Unintentional clutch slip	The clutch cannot transfer a specific torque without slipping	- Yellow lamp is sent - The engine torque is reduced so that the clutch does not continue to slip	N/A

MID 130 PSID 28 Transmission Brake

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 7	Mechanical system not responding or out of adjustment	The transmission brake does not brake when the valve is activated	- Yellow lamp is sent - Slow gear changes at standstill	N/A

MID 130 PSID 200 Communication Interference, Data Link, Engine Control Unit

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 9	Abnormal update rate	Message missing on J1939 from the following control unit: Engine Control Unit (EECU)	- Yellow lamp is sent - If there is no POWER-TRAIN_CAN, automatic gear selection enters backup mode with gear changes only at certain vehicle speeds - If there is no POWER-TRAIN_CAN and if the engine does not receive messages from the TECU, the gear changes will be slow	N/A

MID 130 PSID 201 Communication Interference, Data Link, Vehicle Control Unit

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 8	Abnormal frequency, pulse width, or period	Signal from vehicle control unit indicates fault in the accelerator pedal position or the brake pedal switch	- Yellow lamp is sent - If pedal position undefined, automatic gear selection enters backup mode with gear changes only at certain vehicle speeds - Uneven shifting at start and at slow speed - If service brake undefined, automatic gear selection enters backup mode with gear changes only at certain vehicle speeds	N/A
FMI 9	Abnormal update rate	Message missing on J1939 from the following control unit: Engine Control Unit (EECU)	- Yellow lamp is sent - Automatic gear selection enters backup mode with gear changes only at certain vehicle speeds - Rough shifting at start and at slow speed	N/A

MID 130 PSID 204 Communication Interference, Data Link, Brake Control Unit

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 8	Abnormal frequency, pulse width, or period	This FMI shall be set if the wheel speeds from the BECU (MID 136) are not correct.	- Yellow lamp is sent - Slow gear changes	N/A
FMI 9	Abnormal update rate	This FMI shall be set if the message from the BECU (MID 136) is not received	- Yellow lamp is sent - Slow gear changes	N/A

MID 130 PSID 207 Communication Interference, Data Link, Gear Selector Control Unit

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 9	Abnormal update rate	This FMI shall be set if the message from the GSECU (MID 223) is not received	- Yellow lamp is sent - Slow response on manual gear changes and slow response when buttons on the gearlever are pressed.	N/A

MID 130 PSID 210 J1939 Data Link Interruption, Lighting ECU

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 9	Abnormal update rate	This FMI shall be set if the message from the LCM (MID 216) is not received	- Yellow lamp is sent - The start gear might be wrong - Automatic gear selection performance might be reduced a certain time after start - Automatic gear selection performance might be reduced a certain time after a trailer has been connected/disconnected	N/A

MID 130 PSID 211 J1939 Data Link Interruption, Adaptive Cruise Control ECU

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 9	Abnormal update rate	- This FMI shall be set if the message from the ACC (MID 219) is not received and, - ACC is installed	- Yellow lamp is sent - The retarder ACC function does not work	N/A

MID 130 PSID 232 Powertrain CAN

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
Note: This fault code is valid for vehicles where a POWERTRAIN_CAN link exists between the TECU and the engine				
FMI 2	Data erratic, intermittent, or incorrect	CAN communication does not work	- Yellow lamp is sent - Slow gear shifts	N/A
FMI 9	Abnormal update rate	Message missing on J1939 from the following control unit: Engine Control Unit (EECU)	- Yellow lamp is sent - Slow gear shifts	N/A

MID 130 PSID 254 DIEE Signal

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	Voltage above normal or shorted high	The voltage level for the DIEE pin is high	- Yellow lamp is sent - Cranking is inhibited - Engine cannot start - All communication with the control unit is disabled except for programming of MSW	N/A

MID 130 SID 35 Solenoid Valve, High Range

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	Voltage above normal or shorted high	The high-side drive is short circuit to U-BATT	- Yellow lamp is sent - The valve is activated - Low range gears are missing - Incorrect gear selection	N/A
FMI 5	Current below normal or open circuit	The high-side drive is open circuit	- Yellow lamp is sent - The valve cannot be activated - High range gears are missing - Incorrect gear selection	N/A
FMI 6	Current above normal or grounded circuit	The high-side drive is short circuit to ground	- Yellow lamp is sent - The valve cannot be activated - Range gears are missing - Incorrect gear selection	N/A

MID 130 SID 36 Solenoid Valve, Low Range

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	Voltage above normal or shorted high	The high-side drive is short circuit to U-BATT	- Yellow lamp is sent - The valve is activated - High range gears are missing - Incorrect gear selection	N/A
FMI 5	Current below normal or open circuit	The high-side drive is open circuit	- Yellow lamp is sent - The valve cannot be activated - Low range gears are missing - Incorrect gear selection	N/A
FMI 6	Current above normal or grounded circuit	The high-side drive is short circuit to ground	- Yellow lamp is sent - The valve cannot be activated - Range gears are missing - Incorrect gear selection	N/A

MID 130 SID 37 Solenoid Valve, High Split

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	Voltage above normal or shorted high	The high-side drive is short circuit to U-BATT	- Yellow lamp is sent - The valve is activated - Indirect and neutral split gears are missing - Incorrect gear selection	N/A
FMI 5	Current below normal or open circuit	The high-side drive is open circuit	- Yellow lamp is sent - The valve cannot be activated - Splitter gears are missing - Incorrect gear selection	N/A
FMI 6	Current above normal or grounded circuit	The high-side drive is short circuit to ground	- Yellow lamp is sent - The valve cannot be activated - Splitter gears are missing - Incorrect gear selection	N/A

MID 130 SID 38 Solenoid Valve, Low Split

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	Voltage above normal or shorted high	The high-side drive is short circuit to U-BATT	- Yellow lamp is sent - The valve is activated - Direct and neutral split gears are missing - Incorrect gear selection	N/A
FMI 5	Current below normal or open circuit	The high-side drive is open circuit	- Yellow lamp is sent - The valve cannot be activated - Splitter gears are missing - Incorrect gear selection	N/A
FMI 6	Current above normal or grounded circuit	The high-side drive is short circuit to ground	- Yellow lamp is sent - The valve cannot be activated - Splitter gears are missing - Incorrect gear selection	N/A

MID 130 SID 231 J1939 Control Link

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 2	Data erratic, intermittent, or incorrect	CAN communication does not work	- Yellow lamp is sent - Slow gear shifts	N/A

MID 130 SID 240 Program Memory

Note: The boot program only sets this fault code during power-up. The boot program does not save any fault codes.

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 2	Data erratic, intermittent, or incorrect	Faulty data in program memory	- Yellow lamp is sent - Cranking is inhibited - Engine cannot start	N/A

MID 130 SID 250 J1708 Information Link

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 9	Abnormal update rate	Signal from MID 128 PID 190, PID 85, PPID 212 is not received within 30s	- Yellow lamp is sent - Slow gear shifts - Fault codes cannot be read - On-vehicle tests cannot be performed	N/A

MID 130 SID 253 Calibration Memory EEPROM

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 13	Calibration value out of range	- Flash checksum dataset error - Program code missing	- Yellow lamp is sent - Cranking is inhibited - Engine cannot start	N/A

Vehicle Control Unit, Fault Tracing

The "Premium Tech Tool" (PTT) is the preferred tool for performing diagnostic work. Contact your local dealer for more information.

The control units on the information link communicate according to the SAE J1587 standard. The standard has been extended with Volvo's own supplement (PPID, PSID). The fault codes set by the control units contain information that is described by the following abbreviations.

MID	Message Identification Description: Identification of a control unit.	SID	Subsystem Identification Description: Identification of a component.
PID	Parameter Identification Description: Identification of a parameter (value).	PSID	Proprietary Subsystem Identification Description Volvo: Unique identification of a component.
PPID	Proprietary Parameter Identification Description Volvo: Unique identification of a parameter (value).	FMI	Failure Mode Identifier: Identification of fault types.

FMI Table

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

Note: When performing diagnostic test on intermittent faults, gently wiggle the wires and connectors to help find the intermittent faults.

MID 144 Control Unit, Fault Codes

PID

“MID 144 PID 84 Vehicle Speed” page 111

“MID 144 PID 91 Accelerator Pedal Position (Percentage)” page 112

PPID

“MID 144 PPID 61 Engine Brake Switch” page 113

“MID 144 PPID 69 Buffered Idle Validation Switch” page 113

“MID 144 PPID 70 Pedal Switches, Supply” page 113

“MID 144 PPID 71 Cruise Control and Engine Brake, Switch Supply” page 114

“MID 144 PPID 72 Accelerator Pedal and Engine Brake, Sensors Supply” page 114

“MID 144 PPID 73 Second Accelerator Pedal, Supply Sensors” page 115

“MID 144 PPID 265 Vehicle Speed Sensor Supply” page 115

PSID

“MID 144 PSID 2 Idle Validation Switch 2” page 116

SID

“MID 144 SID 230 Idle Validation Switch 1” page 116

MID 144 PID 84 Vehicle Speed

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 2	Data Erratic, Intermittent or Incorrect	- Intermittent faulty data - Speed signal from speedometer and ABS differs too much - Speed signal from VSS and ABS differs too much	N/A	- VSS Harness - VSS Sensor - VECU - VECU harness
FMI 14	Special instructions	- Intermittent faulty data - Speed signal from VSS was updated incorrectly	N/A	- Faulty information from tachometer - J1587 data link - Wiring harness

MID 144 PID 91 Accelerator Pedal Position (Percentage)

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	Voltage above normal, or shorted to high source	Abnormally high voltage	Engine will not supply requested fuel to engine	- APP harness shorted high - Faulty APP sensor
FMI 4	Voltage below normal, or shorted to low source	Abnormally low voltage	Engine will not supply requested fuel to engine	- APP harness shorted low - Faulty APP sensor
FMI 5	Current below normal or open circuit	- Abnormally low current - Input is not correct compared to IVS 1 & IVS 2	Engine will not supply requested fuel increase	Faulty APP sensor
FMI 6	Current above normal or grounded circuit	- Abnormally high current - Input is not correct compared to IVS 1 & IVS 2	Engine will not supply requested fuel increase	Faulty APP sensor
FMI 14	Special Instructions	- Supply error from PPID 72 - Supply error	Engine will not supply requested fuel increase	Faulty APP sensor harness

MID 144 PPID 61 Engine Brake Switch

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 7	Mechanical system not responding or out of adjustment	SET+ and SET-signal received at the same time	Engine retarder brake will not activate	- Engine retarder switch harness - Engine retarder switch

MID 144 PPID 69 Buffered Idle Validation Switch

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	Voltage above normal, or shorted to high source	Abnormally high voltage or short to higher voltage	N/A	Signal shorted high
FMI 4	Voltage below normal, or shorted to low source	Abnormally low voltage or short to ground	N/A	Signal shorted low

MID 144 PPID 70 Pedal Switches, Supply

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 4	Voltage below normal, or shorted to low source	N/A	N/A	- Faulty connector - Faulty harness - Supply voltage shorted low

MID 144 PPID 71 Cruise Control and Engine Brake, Switch Supply

FMI 4	• Voltage below normal or shorted to low source	• N/A	• Engine will not supply requested fuel increase	• Faulty connector • Faulty harness • Supply voltage shorted low
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MID 144 PPID 72 Accelerator Pedal and Engine Brake, Sensors Supply

FMI 3	• Voltage above normal or shorted to high source	• Abnormally high voltage	• Requested fuel not supplied to engine • Engine brake retarder is disabled	• APP harness shorted high
FMI 4	• Voltage below normal or shorted to low source	• Abnormally low voltage	• Requested fuel not supplied to engine • Engine brake retarder is disabled	• APP harness shorted low

MID 144 PPID 73 Second Accelerator Pedal, Supply Sensors

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	Voltage above normal, or shorted to high source	Abnormally high voltage	- Engine will not supply requested fuel to engine - Engine brake retarder is disabled	APP harness shorted high
FMI 4	Voltage below normal, or shorted to low source	Abnormally low voltage	- Engine will not supply requested fuel to engine - Engine brake retarder is disabled	APP harness shorted low

MID 144 PPID 265 Vehicle Speed Sensor Supply

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 3	Voltage above normal, or shorted to high source	Abnormally high voltage	N/A	- VSS harness shorted high - Faulty VSS
FMI 4	Voltage below normal, or shorted to low source	Abnormally low voltage	N/A	- VSS harness shorted low - Faulty VSS

MID 144 PSID 2 Idle Validation Switch 2

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 7	Mechanical system not responding or out of adjustment	Faulty reading from IVS #2	Engine will not supply requested fuel to engine	- Idle Validation Switch (IVS) - IVS connector - IVS harness

MID 144 SID 230 Idle Validation Switch 1

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 7	Mechanical system not responding or out of adjustment	Faulty reading from IVS #1	Engine will not supply requested fuel to engine	- Idle Validation Switch (IVS) - IVS connector - IVS harness

Gear Selector Control Unit, Fault Tracing

The "Premium Tech Tool" (PTT) is the preferred tool for performing diagnostic work. Contact your local dealer for more information.

The control units on the information link communicate according to the SAE J1587 standard. The standard has been extended with Volvo's own supplement (PPID, PSID). The fault codes set by the control units contain information that is described by the following abbreviations.

MID	Message Identification Description: Identification of a control unit.	SID	Subsystem Identification Description: Identification of a component.
PID	Parameter Identification Description: Identification of a parameter (value).	PSID	Proprietary Subsystem Identification Description Volvo: Unique identification of a component.
PPID	Proprietary Parameter Identification Description Volvo: Unique identification of a parameter (value).	FMI	Failure Mode Identifier: Identification of fault types.

FMI Table

FMI	Display Text	SAE Text
0	Too high value	Data valid, but above the normal work range
1	Too low value	Data valid, but below the normal work range
2	Incorrect data	Data erratic, Intermittent or incorrect
3	Electrical fault	Voltage above normal or shorted high
4	Electrical fault	Voltage below normal or shorted low
5	Electrical fault	Current below normal or open circuit
6	Electrical fault	Current above normal or grounded circuit
7	Mechanical fault	Mechanical system not responding properly
8	Mechanical or electrical fault	Abnormal frequency, pulse width or period
9	Communication fault	Abnormal update rate
10	Mechanical or electrical fault	Abnormal rate of change
11	Unknown fault	Failure mode not identifiable
12	Component fault	Bad intelligent device or component
13	Incorrect calibration	Out of calibration
14	Unknown fault	Special instructions
15	Unknown fault	Reserved for future assignment by SAE Data Format Subcommittee

Note: When performing diagnostic test on intermittent faults, gently wiggle the wires and connectors to help find the intermittent faults.

MID 223 Control Unit, Fault Tracing

PSID

“MID 223 PSID 9 Gear Selector, Position” page 119

“MID 223 PSID 36 Relay Power Supply” page 120

“MID 223 PSID 42 Signals, Key” page 121

“MID 223 PSID 200 Communication Interference, Data Link, Engine Control Unit” page 122

“MID 223 PSID 201 Communication Interference, Data Link, Vehicle Control Unit” page 122

“MID 223 PSID 205 Communication Interference, Data Link, Transmission Control Unit” page 123

“MID 223 PSID 214 No Data From BBM” page 123

SID

“MID 223 SID 231 J1939 Control Link” page 124

“MID 223 SID 240 Program Memory” page 125

“MID 223 SID 250 J1708 Information Link” page 125

“MID 223 SID 253 Calibration Memory EEPROM” page 126

“MID 223 SID 254 Hardware Fault” page 126

MID 223 PSID 9 Gear Selector, Position

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 12	Faulty device or component	The sensor signals do not correspond with valid value	- Yellow lamp is sent - Some or all stalk actions are not working - It is not possible to select gear	N/A

MID 223 PSID 36 Relay Power Supply

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 7	Mechanical system not responding properly	The relay does not release	- Yellow lamp is sent - Fault displayed after ignition OFF - Risk of battery discharge if main circuit breaker is not opened when vehicle is not used	N/A
FMI 12	Faulty device or component	0 voltage at Pin 1	It is not possible to drive the vehicle	N/A

MID 223 PSID 42 Signals, Key

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 2	Data erratic, intermittent, or incorrect	Inconsistency between hard-wired ignition signal and ignition signal read on network	- Yellow lamp is sent - Transmission supplied and Optidriver fully functional until main circuit breaker is opened - Risk of battery discharge if main circuit breaker not opened when vehicle not used - Transmission not supplied and vehicle immobilized after main circuit breaker has been cycled	N/A

MID 223 PSID 200 Communication Interference, Data Link, Engine Control Unit

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 9	Abnormal update rate	Message missing on J1939 from the following control unit: Engine Control Unit (EECU)	- Yellow lamp is sent - Downhill help disabled	N/A

MID 223 PSID 201 Communication Interference, Data Link, Vehicle Control Unit

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 9	Abnormal update rate	Message missing on J1939 from the following control unit: Vehicle Control Unit (VECU)	- Yellow lamp is sent - Temporary manual mode disabled - Downhill help disabled - Return to drive disabled	N/A

MID 223 PSID 205 Communication Interference, Data Link, Transmission Control Unit

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 9	Abnormal update rate	Message missing on J1939 from the following control unit: Transmission Control Unit (TECU)	- Yellow lamp is sent - No memorization during 1.5 sec of direction change requests when vehicle is moving - Temporary manual mode disabled	N/A

MID 223 PSID 214 No Data From BBM

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 9	Abnormal update rate	Message missing on J1939 from the following control unit: Bodybuilder	Yellow lamp is sent	N/A

MID 223 SID 231 J1939 Control Link

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 2	Data erratic, intermittent, or incorrect	CAN communication does not work	- Yellow lamp is sent - Gear lever commands slower (J1587) - No memorization during 1.5 sec of direction change requests when vehicle is moving - Temporary manual mode disabled - Downhill help disabled - Return to drive disabled	N/A

MID 223 SID 240 Program Memory

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 2	Data erratic, intermittent, or incorrect	- Fault data in program memory - The control unit is not programmed	- Yellow lamp is sent - GSECU: No function except supply the relay - Unable to shift out of neutral position	N/A

MID 223 SID 250 J1708 Information Link

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 9	Abnormal update rate	The information link SAE J1587/J1708 is not working	Yellow lamp is sent	A control unit is being programmed

MID 223 SID 253 Calibration Memory EEPROM

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 2	Data erratic, intermittent, or incorrect	Fault in main software	- Yellow lamp is sent - Use of default values of parameters	The control unit is not programmed

MID 223 SID 254 Hardware Fault

Type of fault:	FMI Description:	Fault Condition:	Possible Symptoms:	Possible Cause:
FMI 12	Faulty device or component	Internal fault in control unit	- Yellow lamp is sent - It is not possible to drive the vehicle	Gear selector control unit (GSECU)



Volvo Trucks North America, Inc.

P.O. Box 26115, Greensboro, NC 27402-6115

Volvo Trucks Canada, Ltd.

5600A Cancross Court, Mississauga, Ontario L5R 3E9

<http://www.volvotrucks.volvo.com>