

SERVICE MANUAL

CUMMINS QSB6.7 – CM850

FAULT CODE INFORMATION

INTRODUCTION

There are a few warning lamps in the dashboard which give you important instructions about the status of the engine. The colour of the warning lamp is dependent on the warning status.

1 FAULT DETECTION

Faults are detected while the ignition is on, during the operation of the machine itself. If a fault becomes active a fault is logged in memory and certain faults may illuminate the warning lamp (amber) or the stop lamp (red) or the maintenance lamp depending on the severity of the active fault. If the ignition is on, the warning lamps will illuminate for approximately two seconds and then go off, one after the other, to verify they are working and wired correctly. The following chart summarises the different lamps and their operations;

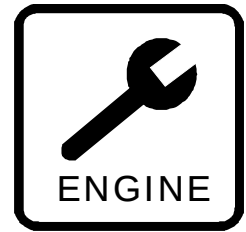
Feature	Operator Message	 Check Engine	 Stop Engine	 Engine Maintenance
Lamp display	Lamp test	On then first off	On then second off	On then third off
Engine protection	System problem		Slow flash	
Diagnostics	Nonfatal system error	On steady		
Diagnostics	Fatal system error		On steady	
Diagnostics	Maintenance required			On steady
Diagnostics	Fault codes flashout	Flash once/code	Flash code number	
Diagnostics	Water In Fuel			On steady

If the STOP or CHECK ENGINE lamp comes on when the engine is running, it means a fault code has been recorded. The lamp will remain on as long as the fault exists. The severity of the fault will determine the lamp that will come on.

2 ENGINE MAINTENANCE LAMP (AMBER)

The maintenance lamp will illuminate for warning of the following points:

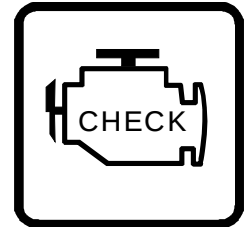
1. The maintenance lamp will illuminate constantly when there is water in the fuel.
Lift the cabin following described instructions and drain the water out of the fuel filter.(see 7 Fuel-water separator)
2. The maintenance lamp will illuminate during engine operation when certain lower priority faults are present.



3 CHECK ENGINE LAMP (AMBER)

The check engine lamp comes on during a nonfatal system error. The engine can still be run, but the fault should be corrected as soon as possible.

Note: In the diagnostic mode, the check engine lamp will flash before and after the three-digit fault code of the Stop Engine lamp.

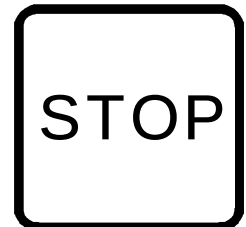


4 STOP ENGINE LAMP (RED)

The stop engine lamp is a red lamp. This lamp indicates that the engine needs to be shut down before permanent damage occurs to the engine.

Note: The engine should be shut off as soon as it can be shut off safely. The engine should **not** be run until the fault is corrected.

If the engine protection system detects a fault, a light or buzzer will come on while driving. This means a fault code has been recorded. The lamp will remain on as long as the fault exist and the engine power and speed will gradually reduced. If the out of range conditions continue the light will start to flash or blink.



This lamp is also used to flash out the fault code number in the diagnostic mode.

M WARNING!

Stop the vehicle as soon as possible when the red stop engine lamp is on or flash. Driving with the red stop engine lamp on or flashing can occurs permanent damage to the engine.

5 FLASH OUT OF FAULT CODES

In the event that a fault needs to be accessed the following procedure should be used.

When a fault or maintenance lamp is lit, the engine diagnostics system allows the user to view the fault codes.

To view the fault codes:

1. The engine must be shut off (not running)
2. The ignition must be ON
3. The accelerator pedal must be cycled from 0 to 100% 3 times.

Once in diagnostic mode, cycling the accelerator pedal 1x 0-100% will sequence forward through the active faults.

The check engine and stop engine lamps automatically flash if there are any fault codes to display.

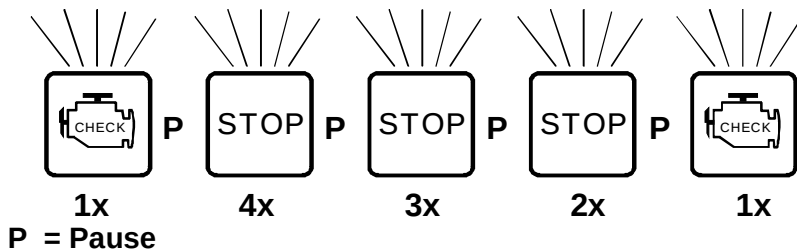
If there are no fault codes to display, the check engine and stop engine lamps will remain lit.

If there are fault codes to be displayed, the check engine lamp will illuminate momentarily. Then the stop engine lamp will flash the first, second, and third digits of the fault code.

Example: Fault Code 432

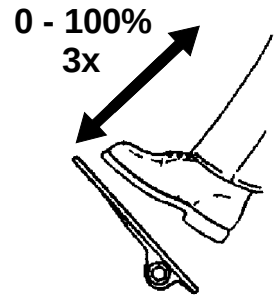
4 flashes, pause
3 flashes, pause
2 flashes.

NOTE: The check engine lamp will flash between each fault code. The diagram below depicts the pattern of the fault code flash out scheme as indicated by the stop lamp.



The pattern repeats itself until the fault is cleared or the ignition is turned off.

To view the next fault code, press the accelerator pedal 1x 0-100%.



Fault Code Information

FAULT CODE {LAMP}	J1587 PID(P) SID(S) {FMI}	J1939 SPN(S) {FMI}	REASON	EFFECT
111 {Red}	S254 {12}	629 {12}	Engine Control Module Critical Internal Failure - Bad Intelligent Device or Component. Error internal to the ECM related to memory hardware failures or internal ECM voltage supply circuits.	Possible no noticeable performance effects, engine dying, or hard starting.
115 {Red}	P190 {2}	612 {2}	Engine Magnetic Crankshaft Speed/Position lost both of two signals - Data Erratic, Intermittent, or Incorrect. The ECM has detected that the primary engine speed sensor and the backup engine speed sensor signals are reversed.	Fueling to injectors is disabled and the engine can not be started.
122 {Amber}	P102 {3}	102 {3}	Intake Manifold 1 Pressure Sensor Circuit - Voltage Above Normal, or Shorted to High source. High signal voltage detected at the intake manifold pressure circuit.	Engine power derate.
123 {Amber}	P102 {4}	102 {4}	Intake Manifold 1 Pressure Sensor Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage or open circuit detected at the intake manifold pressure circuit.	Engine power derate.
124 {Amber}	P102 {0}	102 {16}	Intake Manifold 1 Pressure - Data Valid but Above Normal Operational Range - Moderately Severe Level. Intake manifold pressure has exceeded the maximum limit for the given engine rating.	Engine power derate.
131 {Red}	P091 {3}	091 {3}	Accelerator Pedal or Lever Position Sensor 1 Circuit - Voltage Above Normal, or Shorted to High Source. High voltage detected at accelerator pedal position circuit.	Severe derate in power output of the engine. Limp home power only.
132 {Red}	P091 {4}	091 {4}	Accelerator Pedal or Lever Position Sensor 1 Circuit - Voltage Below Normal, or Shorted to Low Source. Low voltage detected at accelerator pedal position signal circuit.	Severe derate in power output of the engine. Limp home power only.
133 {Red}	P029 {3}	974 {3}	Remote Accelerator Pedal or Lever Position Sensor 1 Circuit - Voltage Above Normal, or Shorted to High Source. High voltage detected at remote accelerator pedal position circuit.	Remote accelerator will not operate. Remote accelerator position will be set to zero percent.
134 {Red}	P029 {4}	974 {4}	Remote Accelerator Pedal or Lever Position Sensor 1 Circuit - Voltage Below Normal, or Shorted to Low Source. Low voltage detected at remote accelerator pedal position signal circuit.	Remote accelerator will not operate. Remote accelerator position will be set to zero percent.
135 {Amber}	P100 {3}	100 {3}	Engine Oil Rifle Pressure 1 Sensor Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage detected at the engine oil pressure circuit.	None on performance. No engine protection for oil pressure.
141 {Amber}	P100 {4}	100 {4}	Engine Oil Rifle Pressure 1 Sensor Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage detected at engine oil pressure circuit.	None on performance. No engine protection for oil pressure.
143 {Amber}	P100 {1}	100 {18}	Engine Oil Rifle Pressure - Data Valid but Below Normal Operational Range - Moderately Severe Level.	None on performance.
144 {Amber}	P110 {3}	110 {3}	Engine Coolant Temperature 1 Sensor Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage or open circuit detected at engine coolant temperature circuit.	Possible white smoke. Fan will stay ON if controlled by ECM. No engine protection for engine coolant temperature.
145 {Amber}	P110 {4}	110 {4}	Engine Coolant Temperature 1 Sensor Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage detected at engine coolant temperature circuit.	Possible white smoke. Fan will stay ON if controlled by ECM. No engine protection for engine coolant temperature.
146 {Amber}	P110 {0}	110 {16}	Engine Coolant Temperature - Data Valid but Above Normal Operation Range - Moderately Severe Level. Engine coolant temperature signal indicates engine coolant temperature is above engine protection warning limit.	Progressive power derate increasing in severity from time of alert.
147 {Red}	P091 {1}	091 {1}	Accelerator Pedal or Lever Position 1 Sensor Circuit Frequency - Data Valid but Below Normal Operational Range - Most Severe Level. A frequency of less than 100 Hz has been detected at the frequency throttle input to the ECM.	Severe derate in power output of the engine . Limp home power only.
148 {Red}	P091 {0}	091 {0}	Accelerator Pedal or Lever Position Sensor 1 - Data Valid but Above Normal Operational Range - Most Severe Level. A frequency of more than 1500 Hz has been detected at the frequency throttle input to the ECM.	Severe derate in power output of the engine. Limp home power only.

FAULT CODE {LAMP}	J1587 PID(P) SID(S) {FMI}	J1939 SPN(S) {FMI}	REASON	EFFECT
151 {Red}	P110 {0}	110 {0}	Engine Coolant Temperature - Data Valid but Above Normal Operational Range - Most Severe Level. Engine coolant temperature signal indicates engine coolant temperature above engine protection critical limit.	Progressive power derate increasing in severity from time of alert. If Engine Protection Shutdown feature is enabled, engine will shut down 30 seconds after Red Stop Lamp starts flashing.
153 {Amber}	P105 {3}	105 {3}	Intake Manifold 1 Temperature Sensor Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage detected at intake manifold air temperature circuit.	Possible white smoke. Fan will stay ON if controlled by ECM. No engine protection for intake manifold air temperature.
154 {Amber}	P105 {4}	105 {4}	Intake Manifold 1 Temperature Sensor Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage detected at intake manifold air temperature circuit.	Possible white smoke. Fan will stay ON if controlled by ECM. No engine protection for intake manifold air temperature.
155 {Red}	P105 {0}	105 {0}	Intake Manifold 1 Temperature - Data Valid but Above Normal Operational Range - Most Severe Level. Intake manifold air temperature signal indicated intake manifold air temperature above engine protection critical limit.	Progressive power derate increasing in severity from time of alert. If Engine Protection Shutdown feature is enabled, engine will shut down 30 seconds after Red Stop Lamp starts flashing.
187 {Amber}	S232 {4}	1080 {4}	Sensor Supply 2 Circuit - Voltage Below Normal, or Shorted to Low Source. Low voltage detected at the sensor supply Number 2 circuit.	Engine power derate.
195 {Amber}	P111 {3}	111 {3}	Coolant Level Sensor 1 Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage detected at engine coolant level circuit.	None on performance.
196 {Amber}	P111 {4}	111 {4}	Coolant Level Sensor 1 Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage detected at engine coolant level circuit.	None on performance.
197 {Amber}	P111 {1}	111 {18}	Coolant Level - Data Valid but Below Normal Operational Range - Moderately Severe level. Low coolant level has been detected.	None on performance.
221 {Amber}	P108 {3}	108 {3}	Barometric Pressure Sensor Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage detected at barometric pressure circuit.	Engine power derate.
222 {Amber}	P108 {4}	108 {4}	Barometric Pressure Sensor Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage detected at barometric pressure circuit.	Engine power derate.
227 {Amber}	S232 {3}	1080 {3}	Sensor Supply 2 circuit - Voltage Above Normal, or Shorted to High Source. High voltage detected at sensor supply Number 2 circuit.	Engine power derate.
234 {Red}	P190 {0}	190 {0}	Engine Crankshaft Speed/Position - Data Valid but Above Normal Operational Range - Most Severe Level. Engine speed signal indicates engine speed above engine protection limit.	Fuel injection disabled until engine speed falls below the overspeed limit.
235 {Red}	P111 {1}	111 {1}	Coolant Level - Data Valid but Below Normal Operational Range - Most Severe Level. Low engine coolant level detected.	Progressive power derate increasing in severity from time of alert. If Engine Protection Shutdown feature is enabled, engine will shut down 30 seconds after Red Stop Lamp starts flashing.
237 {Amber}	S030 {2}	644 {2}	External Speed Command Input (Multiple Unit Synchronization) - Data Erratic, Intermittent, or Incorrect. The throttle input signal to the primary or secondary engine for multiple unit synchronization is less than three percent or more than 97 percent.	Primary or secondary engines may be shutdown.
238 {Amber}	S232 {4}	620 {4}	Sensor Supply 3 Circuit - Voltage Below Normal, or Shorted to Low Source. Low voltage detected on the +5 VDC sensor supply circuit to the engine speed sensor.	Possible hard starting and rough running.
241 {Amber}	P084 {2}	084 {2}	Wheel-Based Vehicle Speed - Data Erratic, Intermittent, or Incorrect. The ECM lost the vehicle speed signal.	Engine speed limited to Maximum Engine Speed without VSS parameter value. Cruise control, gear-down protection, and road speed governor will not work.
242 {Amber}	P084 {10}	084 {10}	Wheel-Based Vehicle Speed Sensor Circuit Tampering has Been Detected - Abnormal Rate of Change. Signal indicates an intermittent connection of VSS tampering.	Engine speed limited to Maximum Engine Speed without VSS parameter value. Cruise control, gear-down protection, and road speed governor will not work.
245 {Amber}	S033 {4}	647 {4}	Fan Control Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage detected at the fan control circuit when commanded on.	The fan may stay on continuously or not run at all.
268 {Amber}	P094 {2}	094 {2}	Fuel Delivery Pressure - Data Erratic, Intermittent, or Incorrect. The ECM has detected that the fuel pressure signal is not changing.	The ECM will estimate fuel pressure and power is reduced.

FAULT CODE {LAMP}	J1587 PID(P) SID(S) {FMI}	J1939 SPN(S) {FMI}	REASON	EFFECT
271 {Amber}	S126 {4}	1347 {4}	Fuel Pump Pressurizing Assembly 1 Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage detected at the fuel pump actuator circuit.	Engine will run poorly at idle. Engine will have low power. Fuel pressure will be higher than commanded.
272 {Amber}	S126 {3}	1347 {3}	Fuel Pump Pressurizing Assembly 1 Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage or open circuit detected at the fuel pump actuator circuit.	Engine will not run or engine will run poorly.
275 {Amber}	S127 {3}	1348 {3}	Fuel Pump Pressurizing Assembly 2 Circuit - Voltage Above Normal, or Shorted to High Source.	Engine will not run or possible low power.
281 {Amber}	S126 {7}	1347 {7}	Fuel Pump Pressurizing Assembly 1 - Mechanical System Not Responding Properly or Out of Adjustment. A pumping imbalance between the front and rear pumping plungers has been detected.	Engine will not run or possible low power.
284 {Amber}	S126 {7}	1347 {7}	Fuel Pump Pressurizing Assembly 1 - Mechanical System Not Responding Properly or Out of Adjustment. Low voltage detected on the ECM voltage supply line to the engine speed sensor.	Possible hard starting and rough running.
285 {Amber}	S231 {9}	639 {9}	SAE J1939 Multiplexing PGN Timeout Error - Abnormal Update Rate. The ECM expected information from a multiplexed device but did not receive it soon enough or did not receive it at all.	At least one multiplexed device will not operate properly.
286 {Amber}	S231 {13}	639 {13}	SAE J1939 Multiplexing Configuration Error - Out of Calibration. The ECM expected information from a multiplexed device but only received a portion of the necessary information.	At least one multiplexed device will not operate properly.
287 {Amber}	P091 {2}	091 {19}	SAE J1939 Multiplexed Accelerator Pedal or Lever Sensor System - Received Network Data In Error. The OEM vehicle electronic control unit detected a fault with its accelerator pedal.	Engine may only idle or engine will not accelerate to full speed.
288 {Red}	P029 {2}	974 {19}	SAE J1939 Multiplexing Remote Accelerator Pedal or Lever Position Sensor Circuit - Received Network Data In Error. The OEM vehicle electronic control unit detected a fault with the remote accelerator.	The engine will not respond to the remote throttle. Engine may only idle. The primary or cab accelerator may be able to be used.
292 {Red}	P441 {14}	441 {14}	Auxiliary Temperature Sensor Input 1 - Special Instructions.	Possible engine power derate.
293 {Amber}	P441 {3}	441 {3}	Auxiliary Temperature Sensor Input 1 Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage or open circuit detected at the OEM auxiliary temperature circuit.	None on performance.
294 {Amber}	P441 {4}	441 {4}	Auxiliary Temperature Sensor Input 1 Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage detected at the OEM auxiliary temperature circuit.	None on performance.
296 {Red}	P223 {14}	1388 {14}	Auxiliary Pressure Sensor Input 1 - Special Instructions.	Possible engine power derate.
297 {Amber}	P223 {3}	1388 {3}	Auxiliary Pressure Sensor Input 1 Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage detected at the OEM pressure circuit.	None on performance.
298 {Amber}	P223 {4}	1388 {4}	Auxiliary Pressure Sensor Input 1 Circuit Voltage Below Normal, or Shorted to Low Source. Low signal voltage or open circuit detected at the OEM pressure circuit.	None on performance.
319 {Maintenance}	P251 {2}	251 {2}	Real Time Clock Power Interrupt - Data Erratic, Intermittent, or Incorrect. Real Time Clock lost power.	None on performance. Data in the ECM will not have accurate time and date information.
322 {Amber}	S001 {5}	651 {5}	Injector Solenoid Driver Cylinder 1 Circuit - Current Below Normal, or Open Circuit. High resistance detected on injector Number 1 circuit or no current detected at Number 1 injector driver or return pin when the voltage supply at the harness is on.	Engine can possibly misfire or run rough.
323 {Amber}	S006 {5}	655 {5}	Injector Solenoid Driver Cylinder 5 Circuit - Current Below Normal, or Open Circuit. High resistance detected on injector Number 5 circuit or no current detected at Number 5 injector driver or return pin when the voltage supply at the harness is on.	Engine can possibly misfire or run rough.
324 {Amber}	S005 {5}	653 {5}	Injector Solenoid Driver Cylinder 3 Circuit - Current Below Normal, or Open Circuit. High resistance detected on injector Number 3 circuit or no current detected at Number 3 injector driver or return pin when the voltage supply at the harness is on.	Engine can possibly misfire or run rough.

FAULT CODE {LAMP}	J1587 PID(P) SID(S) {FMI}	J1939 SPN(S) {FMI}	REASON	EFFECT
325 {Amber}	S006 {5}	656 {5}	Injector Solenoid Driver Cylinder 6 Circuit - Current Below Normal, or Open Circuit. High resistance detected on injector Number 6 circuit or no current detected at Number 6 injector driver or return pin when the voltage supply at the harness is on.	Engine can possibly misfire or run rough.
331 {Amber}	S002 {5}	652 {5}	Injector Solenoid Driver Cylinder 2 Circuit - Current Below Normal, or Open Circuit. High resistance detected on injector Number 2 circuit or no current detected at Number 2 injector driver or return pin when the voltage supply at the harness is on.	Engine can possibly misfire or run rough.
332 {Amber}	S004 {5}	654 {5}	Injector Solenoid Driver Cylinder 4 Circuit - Current Below Normal, or Open Circuit. High resistance detected on injector Number 4 circuit or no current detected at Number 4 injector driver or return pin when the voltage supply at the harness is on.	Engine can possibly misfire or run rough.
334 {Amber}	P110 {2}	110 {2}	Engine Coolant Temperature - Data Erratic, Intermittent, or Incorrect. The engine coolant temperature reading is not changing with engine operation conditions.	The ECM will estimate engine coolant temperature.
342 {Red}	S253 {13}	630 {13}	Electronic Calibration Code Incompatibility - Out of Calibration. An incompatible calibration between the primary and secondary OEM installed ECM's has been detected.	None on performance.
343 {Amber}	S254 {12}	629 {12}	Engine Control Module Warning Internal Hardware Failure - Bad Intelligent Device or Component. Internal ECM failure.	No performance effects or possible severe power derate.
351 {Amber}	S254 {12}	627 {12}	Injector Power Supply - Bad Intelligent Device or Component. The ECM measured injector boost voltage is low.	Possible smoke, low power, engine misfire, and/or engine will not start.
352 {Amber}	S212 {4}	1079 {4}	Sensor Supply 1 Circuit - Voltage Below Normal, or Shorted to Low Source. Low voltage detected at sensor supply Number 1 circuit.	Engine power derate.
386 {Amber}	S212 {3}	1079 {3}	Sensor Supply 1 Circuit - Voltage Above Normal, or Shorted to High Source. High voltage detected at sensor supply Number 1 circuit.	Engine power derate.
387 {Amber}	S212 {3}	1079 {3}	Sensor Supply 1 Circuit - Voltage Above Normal, or Shorted to High Source. High voltage detected at sensor supply circuit for the accelerator pedal position sensor.	Engine will only idle.
415 {Red}	P100 {1}	100 {1}	Engine Oil Rifle Pressure - Data Valid but Below Normal Operational Range - Most Severe Level. Oil pressure signal indicates oil pressure below the engine protection critical limit.	Progressive power derate increasing in severity from time of alert. If Engine Protection Shutdown feature is enabled, engine will shut down 30 seconds after red stop lamp starts flashing.
418 {Maintenance}	P097 {0}	097 {15}	Water in Fuel Indicator - Data Valid but Above Normal Operational Range - Least Severe Level. Water has been detected in the fuel filter.	Possible white smoke, loss of power, or hard starting.
427 {None}	S231 {9}	639 {9}	SAE J1939 Datalink - Abnormal Update Rate. Communication between the electronic control module (ECM) and another device on the SAE J1939 datalink has been lost.	Engine speed will ramp down and remain at idle.
428 {Amber}	P097 {3}	097 {3}	Water in Fuel Indicator Sensor Circuit - Voltage Above Normal, or Shorted to High Source. High voltage detected at the water in fuel circuit.	None on performance. No water in fuel warning available.
429 {Amber}	P097 {4}	097 {4}	Water in Fuel Indicator Sensor Circuit - Voltage Below Normal, or Shorted to Low Source. Low voltage detected at the water in fuel circuit.	None on performance. No water in fuel warning available.
431 {Amber}	S230 {2}	558 {2}	Accelerator Pedal or Lever Idle Validation Switch - Data Erratic, Intermittent, or Incorrect. Voltage detected simultaneously on both idle validation and off-idle validation switches.	Engine will only idle.
432 {Red}	S230 {13}	558 {13}	Accelerator Pedal or Lever Idle Validation Circuit - Out of Calibration. Voltage at idle validation on-idle and off-idle circuit down not match accelerator pedal position.	Engine will only idle.
434 {Amber}	S251 {2}	627 {2}	Power Supply Lost Without Ignition Off -- Data Erratic, Intermittent, or Incorrect. Supply voltage to the ECM fell below 6.2 volts momentarily, or the ECM was not allowed to power down correctly.	Possible no noticeable performance effects, engine dying, or hard starting. Fault information, trip information, and maintenance monitor may be inaccurate.
435 {Amber}	P100 {2}	100 {2}	Engine Oil Rifle Pressure - Data Erratic, Intermittent, or Incorrect. An error in the engine oil pressure switch signal was detected by the ECM.	None on performance. No engine protection for oil pressure.

FAULT CODE {LAMP}	J1587 PID(P) SID(S) {FMI}	J1939 SPN(S) {FMI}	REASON	EFFECT
441 {Amber}	P168 {1}	168 {18}	Battery 1 Voltage - Data Valid but Below Normal Operational Range - Moderately Severe Level. ECM supply voltage is below the minimum system voltage level.	Engine may stop running or be difficult to start.
442 {Amber}	P168 {0}	168 {16}	Battery 1 Voltage - Data Valid but Above Normal Operational Range - Moderately Severe Level. ECM supply voltage is above the maximum system voltage level.	Possible electrical damage to all electrical components.
443 {Amber}	P168 {0}	168 {16}	Battery 1 Voltage - Data Valid but Above Normal Operational Range - Moderately Severe Level. Low voltage detected at sensor supply circuit to the accelerator pedal position sensor.	Engine will only idle.
449 {Red}	P157 {0}	157 {0}	Injector Metering Rail 1 Pressure - Data Valid but Above Normal Operation Range - Most Severe Level.	None or possible engine noise associated with higher injection pressures (especially at idle or light load). Engine power is reduced.
451 {Amber}	P157 {3}	157 {3}	Injector Metering Rail 1 Pressure Sensor Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage detected at the rail fuel pressure sensor circuit.	Power and or speed derate.
452 {Amber}	P157 {4}	157 {4}	Injector Metering Rail 1 Pressure Sensor Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage detected at the rail fuel pressure sensor circuit.	Power and or speed derate.
488 {Amber}	P105 {0}	105 {16}	Intake Manifold 1 Temperature - Data Valid but Above Normal Operational Range - Moderately Severe Level. Intake manifold air temperature signal indicates intake manifold air temperature is above the engine protection warning limit.	Progressive power derate increasing in severity from time of alert.
497 {Amber}	S114 {2}	1377 {2}	Multiple Unit Synchronization Switch - Data Erratic, Intermittent, or Incorrect. Multi-unit synchronous ON/OFF switch and Multi-unit synchronous complimentary ON/OFF switch have different values in the ECM.	Multi-unit synchronization feature is disabled.
523 {Amber}	P089 {2}	611 {2}	Auxiliary Intermediate (PTO) Speed Switch Validation - Data Erratic, Intermittent, or Incorrect. The position of the intermediate speed control switch 1 does not match the position of the intermediate speed control validation switch.	Intermediate speed control switch may not operate correctly.
527 {Amber}	P154 {3}	702 {3}	Auxiliary Input/Output 2 Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage or open circuit has been detected at the auxiliary input/output 2 circuit.	None on performance.
528 {Amber}	P093 {2}	093 {2}	Auxiliary Alternate Torque Validation Switch - Data Erratic, Intermittent, or Incorrect. An error has been detected in the alternate torque switch circuit.	Torque curve setting defaults to the default torque curve.
529 {Amber}	S051 {3}	703 {3}	Auxiliary Input/Output 3 Circuit - Voltage Above Normal, or shorted to High Source. High signal voltage or open circuit has been detected at the auxiliary input/output 3 circuit.	None on performance.
551 {Amber}	S230 {4}	558 {4}	Accelerator Pedal or Lever Idle Validation 1 Circuit - Voltage Below Normal, or Shorted to Low Source. No voltage detected simultaneously on both the idle validation off-idle and on-idle circuits.	Engine will only idle.
553 {Amber}	P157 {0}	157 {16}	Injector Metering Rail 1 Pressure - Data Valid but Above Normal Operational Range - Moderately Severe level. The ECM has detected that fuel pressure is higher than commanded pressure.	None or possible engine noise associated with higher injection pressures (especially at idle or light load). Engine power is reduced.
554 {Amber}	P157 {2}	157 {2}	Injector Metering Rail 1 Pressure - Data Erratic, Intermittent, or Incorrect. The ECM has detected that the fuel pressure signal is not changing.	The ECM will estimate fuel pressure and power is reduced.
559 {Amber}	P157 {1}	157 {18}	Injector Metering Rail 1 Pressure - Data Valid but Below Normal Operational Range - Moderately Severe Level. The ECM has detected that fuel pressure is lower than commanded pressure.	Possibly hard to start, low power, or engine smoke.
584 {Amber}	S039 {3}	677 {3}	Starter Relay Driver Circuit - Voltage Above Normal, or Shorted to High Source. Open circuit or high voltage detected at starter lockout circuit.	Either the engine will not start or the engine will not have starter lockout protection.
585 {Amber}	S039 {4}	677 {4}	Starter Relay Driver Circuit - Voltage Below Normal, or Shorted to Low Source. Low voltage detected at starter lockout circuit.	The engine will not have starter lockout protection.
596 {Amber}	P167 {0}	167 {16}	Electrical Charging System Voltage - Data Valid but Above Normal Operational Range - Moderately Severe Level. High battery voltage detected by the battery voltage monitor feature.	Amber lamp will light until high battery voltage condition is corrected.

FAULT CODE {LAMP}	J1587 PID(P) SID(S) {FMI}	J1939 SPN(S) {FMI}	REASON	EFFECT
597 {Amber}	P167 {1}	167 {18}	Electrical Charging System Voltage - Data Valid but Below Normal Operational Range - Moderately Severe Level. Low battery voltage detected by the battery voltage monitor feature.	Amber lamp will light until low battery voltage condition is corrected.
598 {Red}	P167 {1}	167 {1}	Electrical Charging System Voltage - Data Valid but Below Normal Operational Range - Most Severe Level. Very low battery voltage detected by the battery voltage monitor feature.	Red lamp illuminated until very low battery voltage condition is corrected.
599 {Red}	S025 {14}	640 {14}	Auxiliary Commanded Dual Output Shutdown - Special Instructions. The engine protection limit has been exceeded for the dual outputs calibrated limits.	Engine will shut down.
649 {Maintenance}	S153 {11}	1378 {31}	Engine Oil Change Interval - Condition Exists. Change engine oil and filter.	None on performance, maintenance reminder only.
689 {Amber}	P190 {2}	190 {2}	Engine Crankshaft Speed/Position - Data Erratic, Intermittent, or Incorrect. Loss of signal from crankshaft sensor.	Engine can run rough. Possibly poor starting capability. Engine runs using backup speed sensor. Engine power is reduced.
691 {Amber}	none {3}	1172 {3}	Turbocharger 1 Compressor Inlet Temperature Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage detected at turbocharger compressor inlet air temperature circuit.	Engine power derate.
692 {Amber}	none {4}	1172 {4}	Turbocharger 1 Compressor Inlet Temperature Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage detected at turbocharger compressor inlet air temperature circuit.	Engine power derate.
731 {Amber}	S064 {7}	723 {7}	Engine Speed/Position Camshaft and Crankshaft Misalignment - Mechanical System Not Responding Properly or Out of Adjustment. Mechanical misalignment between the crankshaft and camshaft engine speed sensors.	Engine will run derated. Excessive black smoke, hard start, and rough idle possible.
757 {Amber}	none {11}	611 {31}	Electronic Control Module Data Lost - Condition Exists. Severe loss of data from the ECM.	Possible no noticeable performance effects, engine dying, or hard starting.
778 {Amber}	S064 {2}	723 {2}	Engine Camshaft Speed/Position Sensor - Data Erratic, Intermittent, or Incorrect. The ECM has detected an error in the camshaft position sensor signal.	Possible poor starting. Engine power derate.
779 {Amber}	S051 {11}	703 {11}	Auxiliary Equipment Sensor Input 3 - Root Cause Not Known	Possible engine power derate.
1117 {None}	S251 {2}	627 {2}	Power Supply Lost With Ignition On - Data Erratic, Intermittent, or Incorrect. Supply voltage to the ECM fell below 6.2 VDC momentarily, or the ECM was not allowed to power down correctly (retain battery voltage for 30 seconds after key OFF).	Possible no noticeable performance effects or engine dying or hard starting. Fault information, trip information, and maintenance monitor data may be inaccurate.
1139 {Amber}	S001 {7}	651 {7}	Injector Solenoid Driver Cylinder 1 - Mechanical System Not Responding Properly or Out of Adjustment. Unintended fueling detected in cylinder Number 1.	Engine will shut down.
1141 {Amber}	S002 {7}	652 {7}	Injector Solenoid Driver Cylinder 2 - Mechanical System Not Responding Properly or Out of Adjustment. Unintended fueling detected in cylinder Number 2.	Engine will shut down.
1142 {Amber}	S003 {7}	653 {7}	Injector Solenoid Driver Cylinder 3 - Mechanical System Not Responding Properly or Out of Adjustment. Unintended fueling detected in Cylinder Number 3.	Engine will shut down.
1143 {Amber}	S004 {7}	654 {7}	Injector Solenoid Driver Cylinder 4 - Mechanical System Not Responding Properly or Out of Adjustment. Unintended fueling detected in Cylinder Number 4.	Engine will shut down.
1144 {Amber}	S005 {7}	655 {7}	Injector Solenoid Driver Cylinder 5 - Mechanical System Not Responding Properly or Out of Adjustment. Unintended fueling detected in Cylinder Number 5.	Engine will shut down.
1145 {Amber}	S006 {7}	656 {7}	Injector Solenoid Driver Cylinder 6 - Mechanical System Not Responding Properly or Out of Adjustment. Unintended fueling detected in Cylinder Number 6.	Engine will shut down.
2185 {Amber}	S232 {3}	620 {3}	Sensor Supply 4 Circuit - Voltage Above Normal, or Shorted to High Source. High voltage detected at +5 VDC sensor supply circuit to the accelerator pedal position sensor.	Engine will only idle.

FAULT CODE {LAMP}	J1587 PID(P) SID(S) {FMI}	J1939 SPN(S) {FMI}	REASON	EFFECT
2186 {Amber}	S232 {4}	648 {4}	Sensor Supply 4 Circuit - Voltage Below Normal, or Shorted to Low Source. Low voltage detected at +5 VDC volt sensor supply circuit to the accelerator pedal position sensor.	Engine will only idle.
2215 {Amber}	P094 {1}	094 {18}	Fuel Pump Delivery Pressure - Data Valid but Below Normal Operational Range - Moderately Severe Level. The ECM has detected that fuel pressure is lower than commanded pressure.	Possibly hard to start, low power, or engine smoke.
2216 {Amber}	P094 {0}	094 {16}	Fuel Pump Delivery Pressure - Data Valid but Above Normal Operational Range - Moderately Severe Level. The ECM has detected that fuel pressure is higher than commanded pressure.	None or possible engine noise associated with higher injection pressures (especially at idle or light load).
2217 {Amber}	S240 {11}	630 {31}	Engine Control Module Calibration Program Memory (RAM) Corruption - Condition Exists. Severe loss of data from the ECM.	Possible no noticeable performance effects, engine dying or hard starting. Fault information, trip information, and maintenance monitor data may be inaccurate.
2249 {Amber}	P157 {1}	157 {1}	Injector Metering Rail 1 Pressure - Data Valid but Below Normal Operational Range - Most Severe Level. The ECM has detected that fuel pressure is lower than commanded pressure.	Possibly hard to start, low power, or engine smoke.
2265 {Amber}	P073 {3}	1075 {3}	Electric Lift Pump for Engine Fuel Supply Circuit - Voltage Above Normal, or Shorted to High Source. High voltage or open detected at the fuel lift pump signal circuit.	Engine may be difficult to start.
2266 {Amber}	P073 {4}	1075 {4}	Electric Lift Pump for Engine Fuel Supply Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage detected at the fuel lift pump circuit.	Engine may be difficult to start.
2311 {Amber}	S018 {11}	633 {31}	Electronic Fuel Injection Control Valve Circuit - Condition Exists. Fuel pump actuator circuit resistance too high or too low.	Possible low power.
2321 {None}	P190 {2}	190 {2}	Engine Crankshaft Speed/Position Sensor - Data Erratic, Intermittent, or Incorrect. Crankshaft engine speed sensor intermittent synchronization.	Engine may exhibit misfire as control switches from the primary to the backup speed sensor. Engine power is reduced while the engine operates on the backup speed sensor.
2322 {None}	S064 {2}	723 {2}	Engine Camshaft Speed/Position Sensor - Data Erratic, Intermittent, or Incorrect. Camshaft engine speed sensor intermittent synchronization.	Possible low power.
2346 {None}	none {0}	2789 {15}	Turbocharger Turbine Inlet Temperature (Calculated) - Least Severe Level. Turbocharger turbine inlet temperature has exceeded the engine protection limit.	Engine power derate.
2347 {None}	S309 {0}	2790 {15}	Turbocharger Compressor Outlet Temperature (Calculated) - Data Valid but Above Normal Operational Range - Least Severe Level.	Engine power derate.
2362 {Amber}	S028 {4}	1072 {4}	Engine Brake Actuator Circuit Number 1 - Voltage Below Normal or Shorted to Low Source. Low voltage detected at the engine brake solenoid Number 1 signal circuit.	Engine brake on cylinders 1, 2, and 3 can not be activated or exhaust brake will not operate.
2363 {Amber}	S029 {4}	1073 {4}	Engine Brake Actuator Circuit Number 2 - Voltage Below Normal, or Shorted to Low Source. Low voltage detected at the engine brake solenoid Number 2 signal circuit.	Engine brake on cylinders 4, 5, and 6 can not be activated.
2366 {Amber}	S028 {3}	1072 {3}	Engine Brake Actuator Circuit Number 1 - Voltage Above Normal, or Shorted to High Source. Open circuit or high voltage detected at the engine brake solenoid Number 1 signal circuit.	Engine brake on cylinders 1, 2, and 3 can not be activated or exhaust brake will not operate.
2367 {Amber}	S029 {3}	1073 {3}	Engine Brake Actuator Driver Output 2 Circuit - Voltage Above Normal, or Shorted to High Source. Open circuit or high voltage detected at the engine brake solenoid Number 2 signal circuit.	Engine brake on cylinders 4, 5, and 6 can not be activated.
2377 {Amber}	S033 {3}	647 {3}	Fan Control Circuit - Voltage Above Normal, or Shorted to High Source. Open circuit or high voltage detected at the fan control circuit.	The fan may stay on continuously or not run at all.
2555 {Amber}	S070 {3}	729 {3}	Intake Air Heater 1 Circuit - Voltage Above Normal, or Shorted to High Source. High voltage detected at the intake air heater signal circuit.	The intake air heater may be ON or OFF all the time.
2556 {Amber}	P070 {4}	729 {4}	Intake Air Heater 1 Circuit - Voltage Below Normal, or Shorted to Low Source. Low voltage detected at the intake air heater signal circuit.	The intake air heaters may be ON or OFF all the time.
2557 {Amber}	S057 {3}	697 {3}	Auxiliary Pulse Width Modulation Driver 1 Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage detected at the analog torque circuit.	Can not control transmission.

FAULT CODE {LAMP}	J1587 PID(P) SID(S) {FMI}	J1939 SPN(S) {FMI}	REASON	EFFECT
2558 {Amber}	S057 {4}	697 {4}	Auxiliary Pulse Width Modulation Driver 1 Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage detected at the analog torque circuit.	Can not control transmission.
2963 {None}	P110 {0}	110 {15}	Engine Coolant Temperature - Data Valid but Above Normal Operational Range - Least Severe Level. Engine coolant temperature signal indicates engine coolant temperature is above engine protection warning limit.	Power derate and possible engine shutdown if engine protection shutdown feature is enabled.
2964 {None}	P105 {0}	105 {15}	Intake Manifold 1 Temperature - Data Valid but Above Normal Operational Range - Least Severe Level. Intake manifold air temperature signal indicates intake manifold air temperature is above the engine protection warning limit.	Progressive power derate increasing in severity from time of alert.
2973 {Amber}	P102 {2}	102 {2}	Intake Manifold 1 Pressure - Data Erratic, Intermittent, or Incorrect. The ECM has detected an intake manifold pressure signal that is too high or low for current engine operating conditions.	Engine power derate.

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Specifications

General Information



WARNING

This diagram is provided as a diagnostic tool for trained, experienced technicians only. Troubleshooting presents the risk of equipment damage, personal injury, or death. Troubleshooting must be performed by trained, experienced technicians. See important instructions in the service manual.

Electrical Specifications

Data Link

- Positive wire to chassis ground (J1587 **only**) 3.5 to 5.0 VDC
- Negative wire to chassis ground (J1587 **only**) 0.0 to 2.5 VDC

J1939 BackBone Resistance

- Positive wire to return wire 50 to 70 Ω
- J1939 Termination Resistance 110 to 130 Ω

All Continuity Checks

- OK (no open circuit if less than 10 Ω)

All Shorts to Ground

- OK (no short circuit) if more than 100k Ω

Sensor Specifications

NOTE: To convert to gauge pressure on all psia pressure sensors subtract the barometric pressure from the absolute pressure.

BAROMETRIC (AMBIENT) AIR PRESSURE SENSOR

Altitude (m)	Altitude (ft)	Pressure [psia]	Pressure [inHg]	Voltage (VDC)
0 (sea level)	0	14.7	29.9	3.65 to 4.28
915	3000	13.2	28.9	3.06 to 3.50
1830	6000	11.8	24.0	2.52 to 2.96
2744	9000	10.5	21.4	2.01 to 2.36
3659	12000	9.35	19.0	1.57 to 1.84

INTAKE MANIFOLD PRESSURE SENSOR

10 N•m [88 in-lb]

Pressure (mmHg)	Pressure [in-Hg]	Pressure [psia]	Voltage (VDC)
0	0	0	0.90 to 1.06
381	15	22	1.30 to 1.53
635	25	27	1.57 to 1.84
1549	61	45	2.53 to 2.96
2057	81	55	3.07 to 3.60
2590	102	65	3.61 to 4.23

INTAKE MANIFOLD TEMPERATURE SENSORS

10 N•m [88 in-lb]

Temperature (C°)	Temperature [F°]	Resistance (Ω)
-10	14	8.7k to 9.7k
0	32	5.5k to 6.1k
20	68	2.4k to 2.5k
40	104	1.1k to 1.2k
70	158	418 to 436

Short Circuit to External Voltage

- OK if less than 1.5 VDC

Sensor Supply Voltage

- @ ECM = 4.75 to 5.25 Ω

Solenoids

- Fuel Pump Actuator (EFC) = 2.0 to 4.5 Ω

ECM Connector

- Retaining Cap Screw Torque = 3 N•m [27 in-lb]

ENGINE COOLANT TEMPERATURE SENSOR

Torque = 23 N•m [204 in-lb]

Temperature (C°)	Temperature [F°]	Resistance (Ω)
0	32	30k to 37k
25	77	9.3k to 10.7k
50	122	3.2k to 3.8k
80	176	1.1k to 1.3k
95	203	700 to 800

ENGINE SPEED SENSOR AND CAMSHAFT POSITION SENSOR

Torque = 10 N•m [88 in-lb]

OIL PRESSURE SWITCH

Torque = 23 N•m [204 in-lb]

ACCELERATOR PEDAL (IVS, ISS, AND APS)

- Idle validation circuit resistance:
- For ON and OFF idle states
- IVS - Maximum closed circuit resistance less than 10 Ω
- ISS - Maximum closed circuit resistance less than 125 Ω
- IVS and ISS - Minimum open circuit resistance less than 100k Ω
- Accelerator Position Coil Resistance:
- Between supply and return pins 2000 to 3000 Ω
- Between supply and signal pins (pedal released) 1500 to 3000 Ω
- Between supply and signal pins (pedal depressed) 200 to 1500 Ω

NOTE: Released resistance minus depressed resistance must be 1000 Ω .