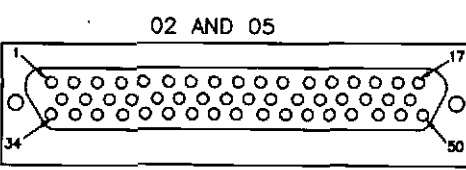
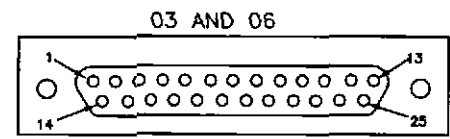
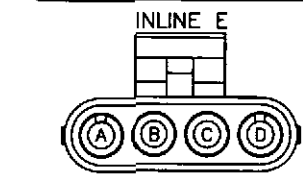
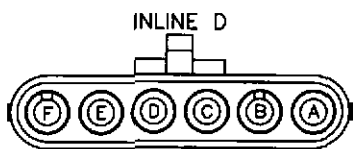
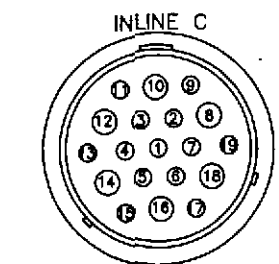
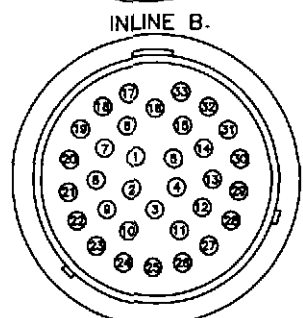
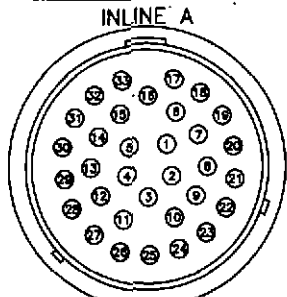


NOTE: SOME OF THE CIRCUITS SHOWN HERE WILL NOT BE ACTIVE IN ALL APPLICATIONS. CONSULT THE EQUIPMENT MANUFACTURER'S LITERATURE TO DETERMINE WHICH CIRCUITS ARE USED.

OEM RESPONSIBILITY

RED DC VOLTAGE
BLUE INPUT SIGNALS
BLACK GROUND, SHIELDS AND RETURNS
PURPLE OUTPUT SIGNALS
GREEN DATA LINKS
REPRESENTS FEMALE PIN <
REPRESENTS MALE PIN >



FAIL TO START
COMMON WARNING
COMMON SHUTDOWN
HIGH ENGINE TEMP
LOW OIL PRESSURE
OVER SPEED
PRE-HIGH ENGINE TEMP
PRE-LOW OIL PRESSURE

DROOP ADJUST
FREQUENCY ADJUST

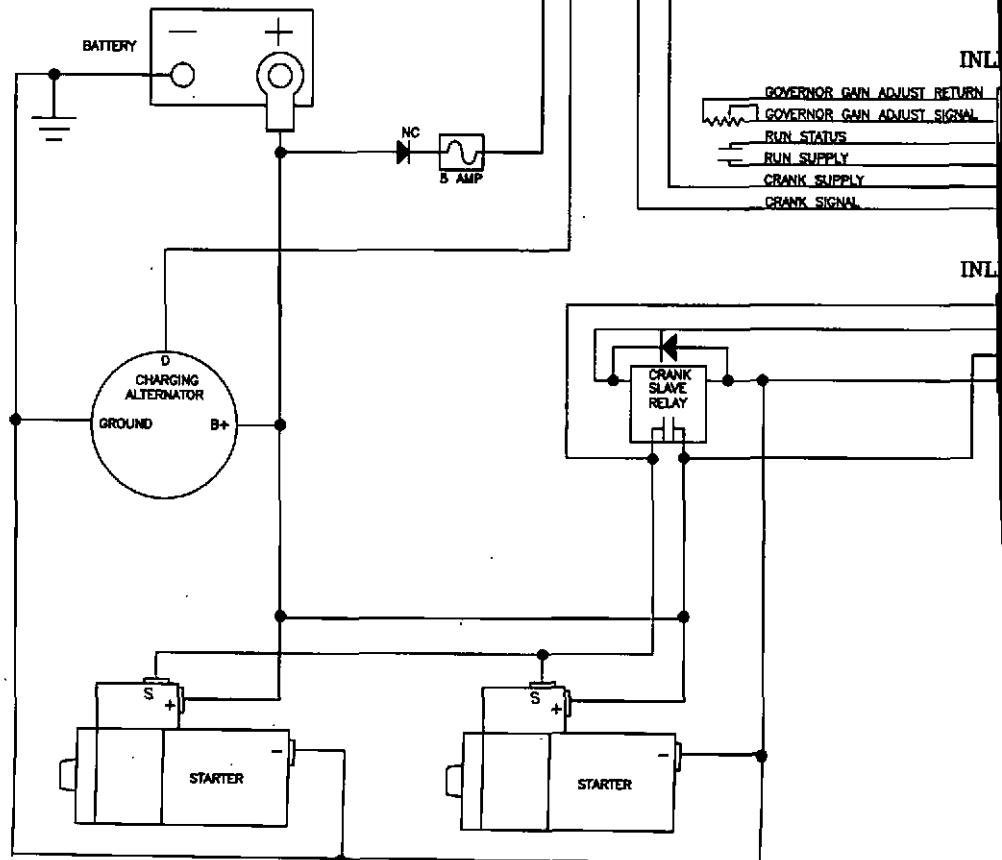
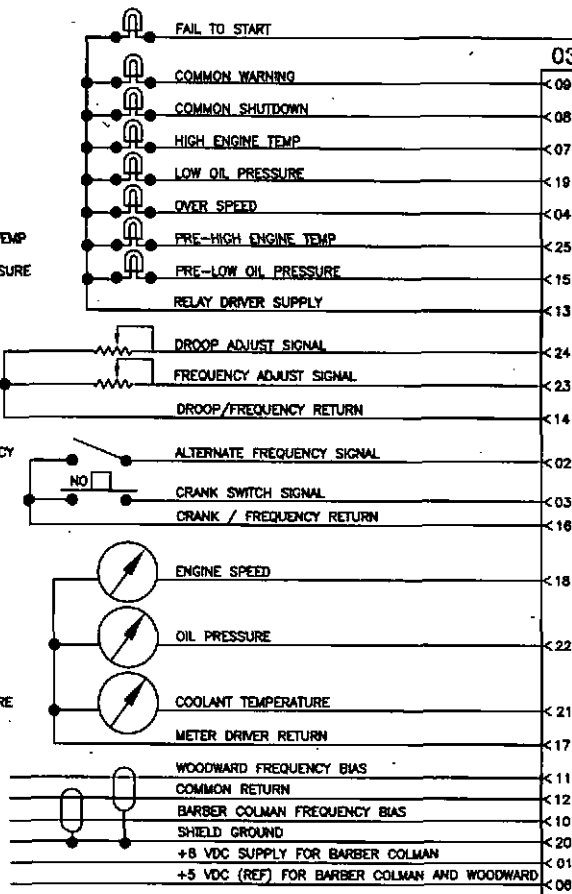
ALTERNATE FREQUENCY

CRANK SWITCH

ENGINE SPEED
METER

OIL PRESSURE
METER

COOLANT TEMPERATURE
METER



QSK45/60 Generator-Drive Control System Wiring Diagram

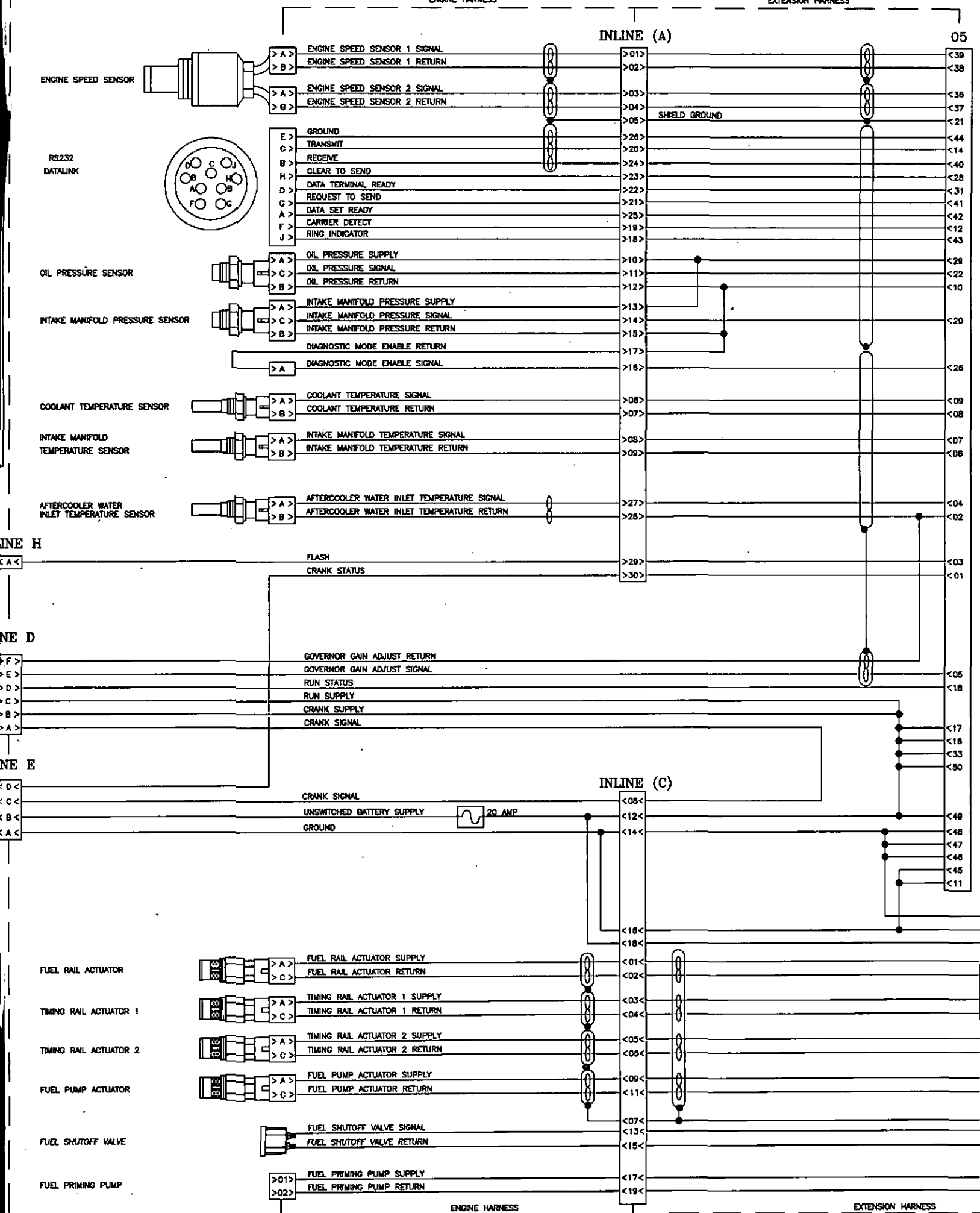
Bulletin 3866347-01

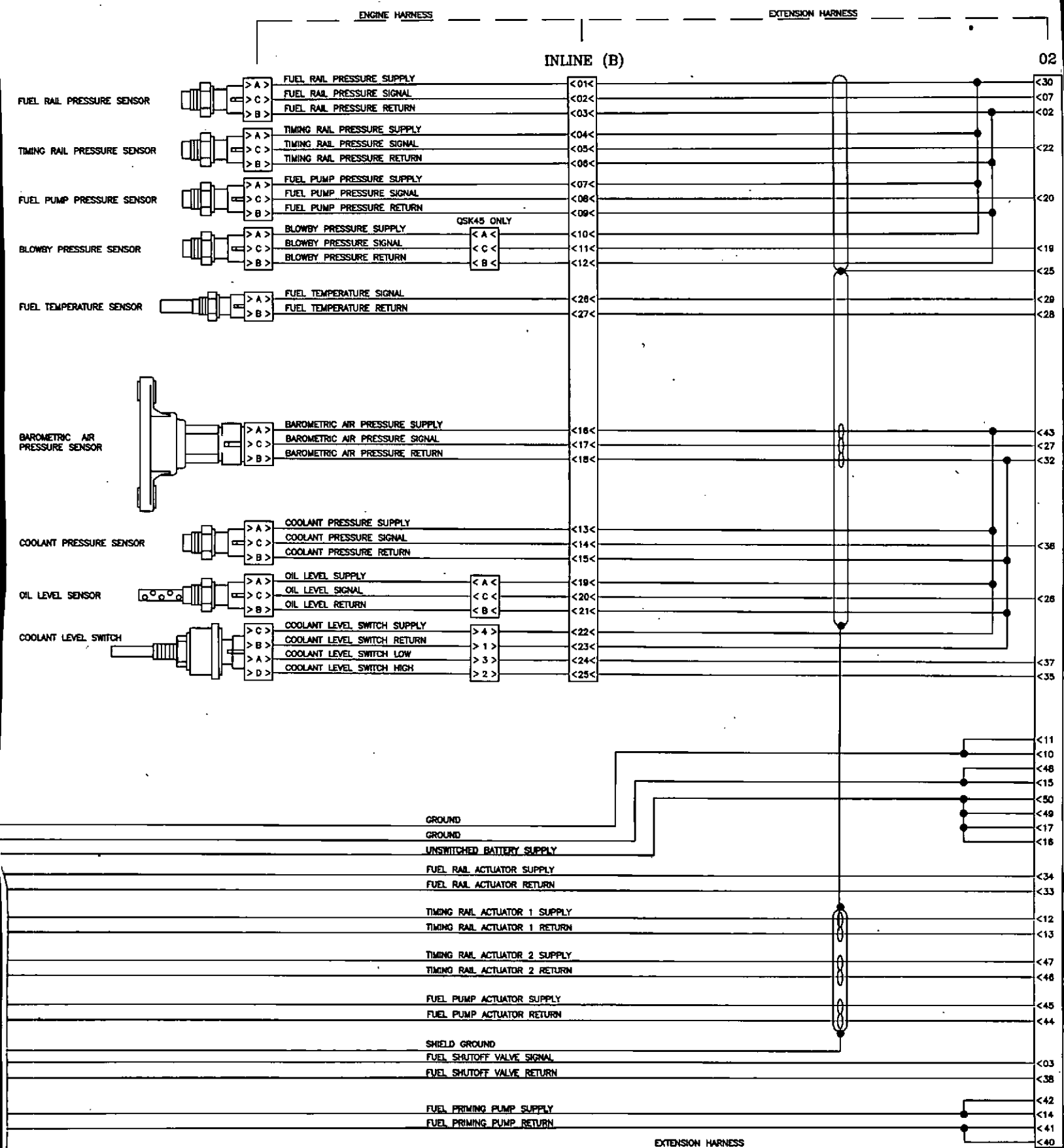
Cummins Engine Company, Inc.

FAULT CODE	LAMP ACTION	REASON	EFFECT (Only when fault code is active)
1424	Warning	Relay high side driver diagnostic has detected an error.	The user interface panel lamps will not function correctly. No action is taken by the ECM.
1425	Warning	Common shutdown relay driver diagnostic has detected an error.	The shutdown panel lamp will not function correctly. No action is taken by the ECM.
1426	Warning	Common warning relay driver diagnostic has detected an error.	The warning panel lamp will not function correctly. No action taken by the ECM.
1427	Warning	Overspeed (OS) relay driver diagnostic has detected an error.	The overspeed panel lamp will not function correctly. No action taken by the ECM.
1428	Warning	Low oil pressure (LOP) relay driver diagnostic has detected an error.	The low oil pressure lamp will not function correctly. No action is taken by the ECM.
1429	Warning	High engine temperature (HET) relay driver diagnostic has detected an error.	The high engine temperature panel lamp will not function correctly. No action is taken by the ECM.
1431	Warning	Pre-Low oil pressure relay driver diagnostic has detected an error.	The Pre-Low oil pressure panel lamp will not function correctly. No action is taken by the ECM.
1432	Warning	Pre-High engine temperature relay driver diagnostic has detected an error.	The Pre-High engine temperature panel lamp will not function correctly. No action is taken by the ECM.
1433	Shutdown	Operator interface mode transition to emergency stop (due to E-Stop).	Engine will shut down and will not restart until the emergency stop switch has been reset.
1434	Shutdown	Operator interface mode transition to emergency stop (due to remote E-Stop).	Engine will shut down and will not restart until the remote emergency stop switch has been reset.
1435	Warning	Engine cold - potential starting problem.	No action is taken by the ECM. Possible hard starting.
1436	Warning	HPI-PT fuel system drivers common diagnostic has detected an error.	No action is taken by the ECM. Possible loss of performance.
1438	Warning	Fail to crank.	No action is taken by the ECM, although the engine will not start.
1443	Shutdown	Battery is dead.	Engine will not start.
1473	Shutdown	The ECM watchdog has failed.	Engine will shut down.
1479	Warning	Fail to start relay driver diagnostic has detected an error.	The fail to start panel lamp will not function correctly. No action is taken by the ECM.
2111	Warning	Engine coolant temperature 2 sensor circuit - shorted high. This was formerly called the aftercooler water inlet temperature sensor.	No engine protection for aftercooler water inlet temperature.
2112	Warning	Engine coolant temperature 2 sensor circuit - shorted low. This was formerly called the aftercooler water inlet temperature sensor.	No engine protection for aftercooler water inlet temperature.
2113	Warning	Engine coolant temperature 2 high - warning. Voltage signal indicates aftercooler water inlet temperature has exceeded the warning threshold for high aftercooler water inlet temperature.	Calibration-dependent engine shut down occurs, or no action is taken by the ECM.
2114	Shutdown	Engine coolant temperature 2 high - critical. Voltage signal indicates aftercooler water inlet temperature has exceeded the shutdown threshold for high aftercooler water inlet temperature.	Engine will shut down.

Bulletin No. 3666347-01
Printed in U.S.A. 5/02

FAULT CODE	LAMP ACTION	REASON	EFFECT (Only when fault code is active)
455	Shutdown	Fuel control valve circuit - shorted high. This was formerly called the fuel rail actuator circuit. Fuel rail actuator circuit is open, or the fuel rail actuator signal pin is shorted to battery voltage or ground, or the fuel rail actuator return pin is shorted to battery voltage or ground.	Engine will run at one speed or will shutdown. Fault Code 514 could possibly also be logged.
467	Warning	Timing rail actuator circuit - data incorrect. The error between desired timing fueling and commanded timing fueling exceeds a normal limit.	No action taken by the ECM. Possible loss of performance.
468	Warning	Fuel rail actuator circuit - data incorrect. The error between desired rail fueling and commanded rail fueling exceeds a normal limit.	No action taken by the ECM. Possible loss of performance.
471	Warning	Engine oil level 1 low - warning. Voltage signal indicates low lubricating oil level in the engine.	Calibration-dependent engine shut down occurs, or no action taken by the ECM.
488	Warning	Intake manifold temperature 1 high - warning. Voltage signal indicates intake manifold temperature has exceeded the warning threshold for high intake manifold temperature.	Calibration-dependent engine shut down occurs, or no action is taken by the ECM. Pre-High engine temperature relay driver is energized.
498	Warning	Engine oil level 1 sensor circuit - shorted high.	No engine protection for low oil level. Centinel™ system is disabled.
499	Warning	Engine oil level 1 sensor circuit - shorted low.	No engine protection for low oil level. Centinel™ system is disabled.
514	Shutdown	Fuel control valve - mechanically stuck. This was formerly called the fuel rail actuator circuit. The error between the estimated rail fueling and desired rail fueling is outside of acceptable limits.	Engine will overspeed, run at one speed, or not run.
554	Warning	Fuel pressure sensor error. Fuel rail pressure sensor in-range error detected at key-on. Voltage signal indicates that the fuel rail pressure sensor signal could possibly not be accurate.	No action taken by the ECM. Possible loss of performance.
555	Warning	Engine blowby - warning level. Voltage signal indicates blowby pressure has exceeded the warning threshold for high blowby.	Calibration-dependent engine shut down occurs, or no action is taken by the ECM.
556	Shutdown	Engine blowby - critical level. Voltage signal indicates blowby pressure has exceeded the shutdown threshold for high blowby.	Engine will shut down.
611	Warning	Engine hot shutdown. Engine shutdown by operator before proper engine cooldown.	No action taken by the ECM. Possible loss of performance. Possible damage to engine could possibly occur.
688	Shutdown	Engine oil level 1 high - critical. Voltage signal indicates very high lubricating oil level in the engine.	Engine will shut down.
649	Warning	Change lubricating oil and filter. The Centinel™ system has not been able to replace old oil with new oil. The condition has persisted for long enough that the oil quality warrants a full change out.	No action taken by ECM. Possible damage to engine could possibly occur.
689	Warning	Primary engine speed sensor error. No engine speed signal detected from the crankshaft engine speed sensor.	No action taken by the ECM. Engine will continue to run on the camshaft engine position sensor. Possible loss of performance.
719	Warning	Crankcase blowby pressure sensor circuit - shorted high.	No engine protection for blowby pressure.
729	Warning	Crankcase blowby pressure sensor circuit - shorted low.	No engine protection for blowby pressure.
1411	Warning	Generator output frequency potentiometer - shorted high.	The frequency adjustment feature will be disabled and a default value of zero will be used. Possible loss of performance.
1412	Warning	Droop adjust potentiometer - shorted high.	The droop adjustment feature will be disabled and a default value of zero will be used. Possible loss of performance.
1413	Shutdown	Controller configuration error.	Engine will not start.
1416	Warning	Fail to shutdown.	The operator has enabled the user-engaged engine shutdown override feature. No engine protection features are working.
1417	Warning	Controller will not power down.	The ECM can not power down from some unknown condition. Possible drain on battery.
1418	Warning	Gain adjust potentiometer - shorted high.	The gain adjustment feature will be disabled and a default value of zero will be used. Possible loss of performance.
1419	Warning	Fuel rail diagnostic has detected an error.	No action taken by the ECM. Possible loss of performance.
1421	Warning	Timing rail driver 1 diagnostic has detected an error.	No action taken by the ECM. Possible loss of performance.
1422	Warning	Timing rail driver 2 diagnostic has detected an error.	No action taken by the ECM. Possible loss of performance.
1423	Warning	Fuel pump diagnostic has detected an error.	No action taken by the ECM. Possible loss of performance.





FAULT CODE	LAMP ACTION	REASON	EFFECT (Only when fault code is active)
228	Shutdown	Engine coolant pressure low - critical. Voltage signal indicates coolant pressure has dropped below the shutdown threshold for low coolant pressure.	Engine will shut down.
231	Warning	Engine coolant pressure sensor circuit - shorted high.	No engine protection for coolant pressure.
232	Warning	Engine coolant pressure sensor circuit - shorted low.	No engine protection for coolant pressure.
233	Warning	Engine coolant pressure low - warning. Voltage signal indicates coolant pressure has dropped below the warning threshold for low coolant pressure.	Calibration-dependent engine shut down occurs, or no action is taken by the ECM.
234	Shutdown	Engine speed high - critical. Voltage signal indicates engine speed has exceeded the shutdown threshold for engine overspeed.	Engine will shutdown. Overspeed relay driver is energized.
235	Shutdown	Engine coolant level low - critical. Voltage signal indicates very low radiator coolant level.	Engine will shut down.
236	Shutdown	Engine position sensor circuit - lost the signal from the engine position sensor.	Engine will shut down.
252	Warning	Engine oil level 1 sensor circuit - data incorrect.	No engine protection for low oil level. Centinel™ system is disabled.
253	Shutdown	Engine oil level 1 low - critical. Voltage signal indicates very low lubricating oil level in the engine.	Engine will shut down.
254	Shutdown	Fuel shutoff valve circuit - shorted low. Low voltage detected at the fuel shutoff valve signal pin, or the resistance of the solenoid has dropped below specified threshold.	Engine will shut down.
259	Warning	Fuel shutoff valve - stuck open.	No action is taken by the ECM. Possible slow engine shutdown.
261	Warning	Fuel temperature high - warning. Voltage signal indicates fuel temperature has exceeded the warning threshold or high fuel temperature.	Calibration-dependent engine shut down occurs, or no action is taken by the ECM.
263	Warning	Fuel temperature sensor circuit - shorted high.	No engine protection for fuel temperature.
265	Warning	Fuel temperature sensor circuit - shorted low.	No engine protection for fuel temperature.
266	Shutdown	Fuel temperature high - critical. Voltage signal indicates fuel temperature has exceeded the shutdown threshold for high fuel temperature.	Engine will shut down.
316	Warning	Fuel supply pump actuator circuit - shorted high. Fuel pump actuator circuit is open, or the fuel pump actuator signal pins shorted to battery voltage or ground, or fuel pump actuator return pin is shorted to battery voltage or ground.	No action is taken by ECM. Possible loss of performance. Actuator is open, or partially closed.
318	Warning	Fuel supply pump actuator - mechanically stuck. The error between the estimated fuel pump pressure and the desired fuel pump pressure is outside the allowable limits.	No action is taken by ECM. Possible loss of performance.
326	Warning	Engine oil level 1 low - warning. Voltage signal indicates low lubricating oil level in the engine.	Calibration-dependent engine shut down occurs, or no action is taken by the ECM.
343	Warning	Engine control module - warning internal hardware failure. Error internal to the ECM.	No action is taken by the ECM. Possible loss of performance.
359	Warning	Engine failed to start.	No action is taken by the ECM, although the engine will not start.
415	Shutdown	Engine oil pressure low - critical. Voltage signal indicates oil pressure has dropped below the shutdown threshold for low oil pressure.	Engine will shut down. Low oil pressure relay driver is energized.
421	Warning	Engine oil temperature high - warning. Voltage signal indicates oil temperature has exceeded the warning threshold for high oil temperature.	Calibration-dependent engine shut down occurs, or no action is taken by the ECM.
422	Warning	Engine coolant level sensor circuit - data incorrect. Voltage detected simultaneously on both the coolant level high and low signal pins - or - no voltage detected on either pin.	No engine protection for coolant level.
423	Warning	Fuel timing pressure or timing actuator stuck. Timing pressure sensor in-range error detected. Voltage signal indicates that the timing pressure sensor signal could possibly not be accurate.	No action taken by the ECM. Possible loss of performance.
441	Warning	Battery 1 voltage low - warning.	ECM voltage supply approaching level at which unpredictable operation will occur.
442	Warning	Battery 1 voltage high - warning.	ECM damage will occur.
451	Warning	Injector metering rail 1 pressure sensor circuit - shorted high. This was formerly called the fuel rail pressure sensor.	Calibration-dependent engine shut down occurs, or no action is taken by ECM.
452	Warning	Injector metering rail 1 pressure sensor circuit - shorted low. This was formerly called the fuel rail pressure sensor.	Calibration-dependent engine shut down occurs, or no action is taken by ECM.

Specifications

Electronic Components

▲ WARNING ▲

This diagram is provided as a diagnostic tool for trained, experienced technicians only. Improper troubleshooting or repair can result in severe personal injury or death or property damage. See important instructions in service manual.

ELECTRICAL SPECIFICATIONS

DATA LINK

- Positive wire to chassis ground
 - 2.5 to 5.0 VDC
- Negative wire to chassis ground
 - 0.0 to 2.5 VDC

ALL CONTINUITY CHECKS

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

ALL SHORTS TO GROUND

- ESS circuits
 - OK (no short circuit) if more than 10M Ω
- All other circuits
 - OK (no short circuit) if more than 100k Ω

SHORT CIRCUIT TO EXTERNAL VOLTAGE

- OK if less than 1.5 VDC

SENSOR SPECIFICATIONS

OIL PRESSURE SENSOR

Torque = 14 N•m [124 in-lb]

Pressure (kPa)	Pressure (psig)	Pressure [inHg]	Voltage (VDC)
0	0	0	0.22 to 0.80
103	15	30.54	1.00 to 1.20
172	25	50.90	1.33 to 1.68
345	50	101.80	2.17 to 2.83
517	75	152.70	3.09 to 3.91
689	100	203.60	4.10 to 4.92

BAROMETRIC (AMBIENT AIR) PRESSURE SENSOR

Torque = 23 N•m [204 in-lb]

Pressure (kPa)	Pressure (psia)	Pressure [inHg]	Voltage (VDC)
0	0	0	0.32 to 0.69
34.47	5	10.18	1.58 to 2.09
68.95	10	20.36	2.89 to 3.45
103.42	15	30.54	4.12 to 4.85

COOLANT OR INTAKE MANIFOLD PRESSURE SENSOR

Torque = 14 N•m [124 in-lb]

Pressure (kPa)	Pressure (psia)	Pressure [inHg]	Voltage (VDC)
0	0	0	0.22 to 0.80
103	15	30.54	1.23 to 1.40
207	30	61.08	1.97 to 2.27
310	45	91.62	2.71 to 3.16
414	60	122.16	3.45 to 4.04
517	75	152.70	4.20 to 4.92

FUEL PUMP OR TIMING RAIL PRESSURE SENSOR

Torque = 14 N•m [124 in-lb]

Pressure (kPa)	Pressure (psia)	Pressure [inHg]	Voltage (VDC)
0	0	0	0.48 to 0.53
103.42	15	30.54	0.63 to 0.67
345	50	101.8	0.98 to 1.13
1034	150	305.4	1.98 to 2.33
1724	250	509	2.97 to 3.55
2585	375	763.5	4.18 to 4.92

FUEL RAIL PRESSURE SENSOR

Torque = 14 N•m [124 in-lb]

Pressure (kPa)	Pressure (psia)	Pressure [inHg]	Voltage (VDC)
103	15	30.54	0.48 to 0.52
345	50	101.80	1.03 to 1.17
689	100	203.6	1.81 to 2.09
1034	150	305.4	2.59 to 3.00
1379	200	407.2	3.38 to 3.93
1724	250	509	4.17 to 4.84

ALL TEMPERATURE SENSORS

Torque = 15 N•m [133 in-lb]

Temperature (°C)	Temperature [°F]	Resistance (Ω)
0	32	30K to 36K
25	77	9K to 11K
50	122	3K to 4K
75	167	1350 to 1500
100	212	600 to 675

ENGINE SPEED SENSOR

Torque = 34 to 47 N•m [25 to 35 ft-lb]

First Coil Resistance = 750 to 1100 Ω

Second Coil Resistance = 1100 to 1500 Ω

QSK45/60 GENERATOR-DRIVE FAULT CODE INFORMATION

FAULT CODE	LAMP ACTION	REASON	EFFECT (Only when fault code is active)
111	Shutdown	Engine control module - critical internal failure.	Engine will not start.
112	Shutdown	Engine timing actuator is not responding to ECM commands. The error between the estimated timing fueling and the desired timing fueling is outside the allowable limits.	Calibration-dependent engine shut down occurs, or no action is taken by ECM.
113	Warning	Engine timing actuator circuit - shorted high. Timing actuator circuit is open, the timing rail actuator signal pin is shorted to ground, or the timing rail actuator return pin is shorted to battery.	No action by the ECM is taken. Actuator is open, closed, or partially closed. Engine power output will vary, and white smoke could possibly occur. Fault Code 112 can also be logged.
115	Shutdown	Engine speed/position sensor circuit - lost both of two signals from the magnetic pickup sensor.	Engine is shut down and can not be run.
116	Shutdown	Fuel timing pressure sensor circuit - shorted high.	Calibration-dependent engine shut down occurs, or no action is taken by ECM.
117	Shutdown	Fuel timing pressure sensor circuit - shorted low.	Calibration-dependent engine shutdown occurs, or no action is taken by ECM.
118	Warning	Fuel pump delivery pressure sensor circuit - shorted high.	No action is taken by the ECM. Possible loss of performance.
119	Warning	Fuel pump delivery pressure sensor circuit - shorted low.	No action taken by the ECM. Possible loss of performance.
121	Warning	Engine speed/position sensor circuit - lost one of two signals from the magnetic pickup sensor.	No action is taken by the ECM.
122	Warning	Intake manifold pressure sensor 1 circuit - shorted high (left bank).	No action is taken by the ECM. Possible loss of performance.
123	Warning	Intake manifold pressure sensor 1 circuit - shorted low (left bank).	No action is taken by the ECM. Possible loss of performance.
135	Warning	Engine oil pressure sensor circuit - shorted high.	No engine protection for oil pressure.
141	Warning	Engine oil pressure sensor circuit - shorted low.	No engine protection for oil pressure.
143	Warning	Engine oil pressure low - warning. Voltage signal indicates oil pressure has dropped below the warning threshold for low oil pressure.	Calibration-dependent engine shut down occurs, or no action taken by ECM. Pre-Low oil pressure relay driver is energized.
144	Warning	Engine coolant temperature sensor circuit - shorted high.	No engine protection for coolant temperature. Possible white smoke.
145	Warning	Engine coolant temperature sensor circuit - shorted low.	No engine protection for coolant temperature. Possible white smoke.
146	Warning	Engine coolant temperature high - warning. Voltage signal indicates coolant temperature has exceeded above the warning threshold for high coolant temperature.	Calibration-dependent engine shut down occurs, or no action is taken by ECM. Pre-High engine temperature relay driver is energized.
151	Shutdown	Engine coolant temperature high - critical. Voltage signal indicates coolant temperature has exceeded the shutdown threshold for high coolant temperature.	Engine will shut down. High engine temperature relay driver is energized.
152	Warning	Engine coolant temperature low - warning. Voltage signal indicates coolant temperature has dropped below the warning threshold for low coolant temperature.	No action is taken by ECM. Possible hard starting.
153	Warning	Intake manifold temperature sensor 1 circuit - shorted high (left bank).	No engine protection for intake manifold temperature. Possible smoke at engine start-up and no-load operation.
154	Warning	Intake manifold temperature sensor 1 circuit - shorted low (left bank).	No engine protection for intake manifold temperature. Possible smoke at engine start-up and no-load operation.
155	Shutdown	Intake manifold temperature 1 high - critical. Voltage signal indicates intake manifold temperature has exceeded the shutdown threshold for high intake manifold temperature (left bank).	Engine will shut down. High engine temperature relay driver is energized.
197	Warning	Engine coolant level low - warning. Voltage signal indicates low radiator coolant level.	No action is taken by the ECM. Fault Code 146, 151, 228, and/or 233 could possibly also be logged.
212	Warning	Engine oil temperature sensor circuit - shorted high.	No engine protection for oil temperature.
213	Warning	Engine oil temperature sensor circuit - shorted low.	No engine protection for oil temperature.
214	Shutdown	Engine oil temperature high - critical. Voltage signal indicates oil temperature has exceeded the shutdown threshold for high oil temperature.	Engine will shut down.
219	Warning	Engine oil level 2 (remote) low - maintenance. Low oil level is detected in the remote oil reservoir used in the Centinel™ system.	Centinel™ system is disabled.
221	Warning	Barometric pressure sensor circuit - shorted high.	No action is taken by the ECM. Possible loss of performance.
222	Warning	Barometric pressure sensor circuit - shorted low.	No action is taken by the ECM. Possible loss of performance.
223	Warning	Engine oil burn valve solenoid circuit - shorted low. The Centinel™ actuator circuit is open or shorted.	ECM turns off the Centinel™ actuator supply voltage, and the Centinel™ system is disabled.
224	Warning	Engine oil burn valve solenoid circuit - shorted high. The Centinel™ actuator is shorted.	ECM turns off the Centinel™ actuator supply voltage, and the Centinel™ system is disabled.