

GROUP 9 SELF-DIAGNOSTIC SYSTEM (up to #0077)

1. OUTLINE

When any abnormality occurs in the NEW CAPO system caused by electric parts malfunction and by open or short circuit, the CPU controller diagnoses the problem and sends the error codes to the cluster and also stores them in the memory.

The current or recorded error codes are displayed at the error display mode selected by touching **SELECT** switch 2 times while pressing **BUZZER STOP** switch.

2. CURRENT ERROR DISPLAY

Cluster displays **Co : Er** and makes buzzer sound itself to warn the communication error when communication problem caused by wire-cut or malfunction of the CPU controller occurs.

Cluster displays real time error codes received from CPU controller through communication. In case of no problem it displays **CHECK Er : 00**.

If there are more than 2 error codes, each one can be displayed by pressing **▲** and **▼** switch respectively.

Examples :

1) Communication Error

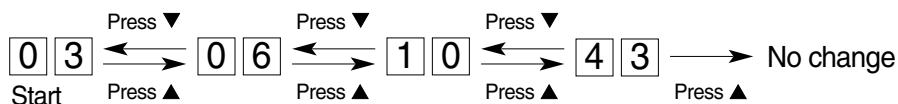
Co : Er & Buzzer sound

2) No problem

CHECK Er : 00

3) 4 Error codes(03, 06, 10, 43) display

CHECK Er : 03

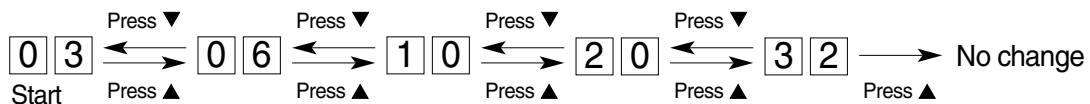


3. RECORDED ERROR DISPLAY

The recorded error can be displayed only when the key switch is at ON position.

Examples : 5 Recorded error codes(03, 06, 10, 20, 32) display

TIME Er : 03



4. DELETE ALL RECORDED ERROR CODES

Select recorded error(**TIME Er**) display and press engine **OFF** and select switch **ON** at the same time for 2 seconds or more. Cluster display changes to **TIME Er : 00**, which shows that CPU controller deleted all the recorded error codes in the memory.

5. ECM ERROR CODES DISPLAY

If any fault code is received from ECM, cluster turns on the "Engine check" and sound the buzzer.

The fault codes are displayed on the cluster as the same as current error display.

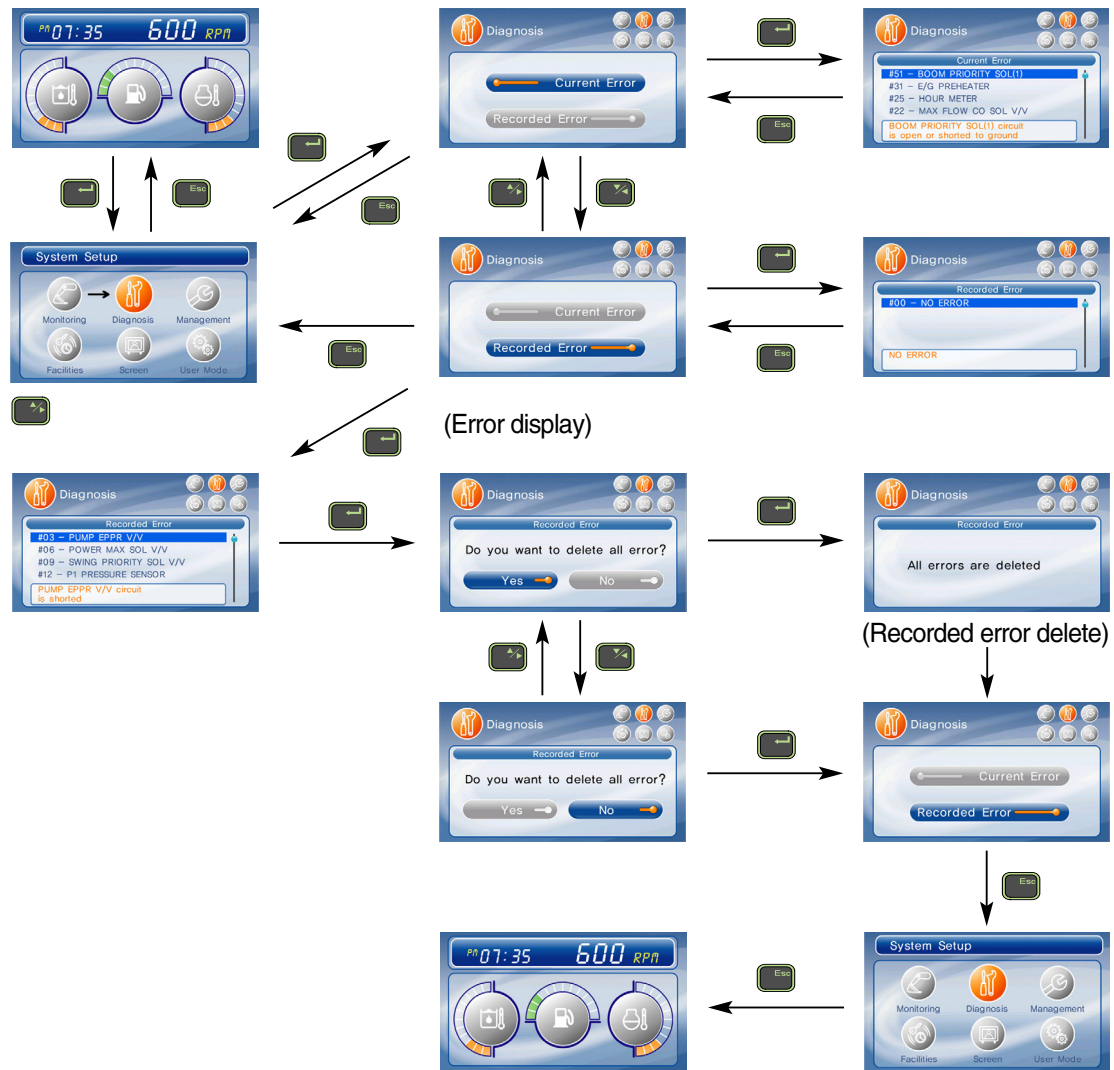
ex) Check Er : 143

GROUP 9 SELF-DIAGNOSTIC SYSTEM (#0078 and up)

1. OUTLINE

When any abnormality occurs in the NEW CAPO system caused by electric parts malfunction and by open or short circuit, the CPU controller diagnoses the problem and sends the error codes to the cluster and also stores them in the memory.

2. CURRENT ERROR DISPLAY



6. ERROR CODES TABLE

Error code No.	Description
1	Short circuit in accel actuator system
2	Potentiometer circuit is shorted to Vcc(5V) or battery +
3	Short circuit in pump EPPR valve system
4	Short circuit in boom down EPPR valve system
5	Short circuit in travel speed solenoid system
6	Short circuit in power boost solenoid system
7	Short circuit in max flow solenoid system
10	Short circuit in hour-meter system
11	Accel dial circuit is shorted to Vcc(5V) or battery +
12	P1 pressure sensor circuit is shorted to power supply(24V) line
13	P2 pressure sensor circuit is shorted to power supply(24V) line
14	P3 pressure sensor circuit is shorted to power supply(24V) line
15	Boom down pressure circuit is shorted to power supply(24V) line
16	Accel actuator circuit is open or shorted to ground
17	Potentiometer circuit is open or shorted to ground
18	Pump EPPR valve circuit is open or shorted to ground
19	Boom down EPPR valve circuit is open or shorted to ground
20	Travel speed solenoid circuit is open or shorted to ground
21	Power boost solenoid circuit is open or shorted to ground
22	Max flow solenoid circuit is open or shorted to ground
25	Hour-meter circuit is open or shorted to ground
26	Accel dial circuit is open or shorted to ground
27	P1 pressure sensor circuit is open or shorted to ground
28	P2 pressure sensor circuit is open or shorted to ground
29	P3 pressure sensor circuit is open or shorted to ground
30	Boom down pressure sensor circuit is open or shorted to ground
31	Engine preheater circuit is open or shorted to ground
32	Travel alarm buzzer circuit is open or shorted to ground
33	Alternator circuit is open or shorted to ground
34	Controller input voltage is below 18V

Error code No.	Description
35	Controller input voltage is over 38V
36	Communication error with cluster
37	Engine speed sensor circuit is open or shorted to ground
38	Anti-restart relay circuit is open or shorted to ground
39	Accel actuator does not stop at a target position
40	There is more than 500rpm difference between target speed and actual speed
41	Hydraulic oil temperature sensor circuit is shorted to ground
42	Fuel level sensor circuit is shorted to ground
43	Coolant temperature sensor circuit is shorted to ground
44	Boom up pressure sensor circuit is shorted to power supply(24V) line
45	Hydraulic oil temperature sensor circuit is open or shorted to battery +
46	Fuel level sensor circuit is open or shorted to battery +
47	Coolant temperature sensor circuit is open or shorted to battery +
48	Boom up pressure sensor circuit is open or shorted to ground
49	Engine preheater circuit is shorted to battery +
51	Boom priority solenoid circuit is open or shorted to ground
56	Travel alarm buzzer circuit is shorted to battery +
58	Boom priority solenoid circuit is shorted to battery +

7. ENGINE FAULT CODE INFORMATION

Fault code No.	Reason	Effect (only when fault code is active)
111	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	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	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	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	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	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	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	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	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	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	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	Engine oil rifle pressure - Data valid but below normal operational range - Moderately severe level.	None on performance.
144	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.

Fault code No.	Reason	Effect (only when fault code is active)
145	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	Engine Coolant Temperature - Data Valid but Above Normal Operational 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	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	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.
151	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	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	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	Intake Manifold 1 Temperature - Data Valid but Above Normal Operational Range - Most Severe Level. Intake manifold air temperature signal indicates 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	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	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	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	Coolant Level - Data Valid but Below Normal Operational Range - Moderately Severe Level. Low coolant level has been detected.	None on performance.
221	Barometric Pressure Sensor Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage detected at barometric pressure circuit.	Engine power derate.

Fault code No.	Reason	Effect (only when fault code is active)
222	Barometric Pressure Sensor Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage detected at barometric pressure circuit.	Engine power derate.
227	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	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	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	External Speed Command Input (Multiple Unit Synchronization) - Data Erratic, Intermittent, or Incorrect. Communication between multiple engines may be intermittent.	
238	Sensor Supply 3 Circuit - Voltage Below Normal, or Shorted to Low Source. Low voltage detected on the +5 volt sensor supply circuit to the engine speed sensor.	Possible hard starting and rough running.
241	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	Wheel-based vehicle speed sensor circuit tampering has been detected - Abnormal rate of change. Signal indicates an intermittent connection or 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	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.
271	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	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.
281	Fuel pump pressurizing assembly 1 - Mechanical system not responding properly or out of adjustment.	Engine will not run or possible low power.
285	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	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.

Fault code No.	Reason	Effect (only when fault code is active)
287	SAE J1939 multiplexed accelerator pedal or lever sensor system - received network data In error. The OEM vehicle electronic control unit (VECU) detected a fault with its accelerator pedal.	Engine may only idle or engine will not accelerate to full speed.
288	SAE J1939 Multiplexing Remote Accelerator Pedal or Lever Position Sensor Circuit - Received Network Data In Error. The OEM vehicle electronic control unit (VECU) 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	Auxiliary temperature Sensor Input 1 - Special instructions.	Possible engine power derate.
293	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	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	Auxiliary pressure sensor input 1 - Special instructions.	Possible engine power derate.
297	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	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	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	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	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	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.
325	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.

Fault code No.	Reason	Effect (only when fault code is active)
331	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	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	Engine coolant temperature - Data erratic, intermittent, or incorrect. The engine coolant temperature reading is not changing with engine operating conditions.	The ECM will estimate engine coolant temperature.
342	Electronic calibration code incompatibility - Out of calibration. An incompatible calibration has been detected in the ECM.	Possible no noticeable performance effects, engine dying, or hard starting.
343	Engine control module warning internal hardware failure - Bad intelligent device or component. Internal ECM failure.	No performance effects or possible severe power derate.
351	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	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	Sensor supply 1 circuit - Voltage above normal, or shorted to high source. High voltage detected at sensor supply number 1 circuit.	Engine power derate.
415	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	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.
428	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	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	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	Accelerator pedal or lever idle validation circuit - Out of calibration. Voltage at idle validation on-idle and off-idle circuit does not match accelerator pedal position.	Engine will only idle.
435	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 No.	Reason	Effect (only when fault code is active)
441	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	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.
449	Injector metering rail 1 pressure - Data valid but above normal operational 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	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	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	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	Multiple unit synchronization switch - Data erratic, intermittent, or incorrect.	
523	Auxiliary intermediate (PTO) speed switch validation - Data erratic, intermittent, or incorrect.	None on performance.
527	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	Auxiliary alternate torque validation switch - Data erratic, intermittent, or incorrect.	None on performance.
529	Auxiliary input/output 3 circuit - Voltage above normal, or shorted to high source. Low signal voltage has been detected at the auxiliary input/output 2 circuit.	
553	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.	The ECM will estimate fuel pressure and power is reduced.
554	Injector metering rail 1 pressure - Data erratic, Intermittent, or incorrect. The ECM has detected that the fuel pressure signal is not changing.	Possibly hard to start, low power, or engine smoke.
559	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.	Either the engine will not start or the engine will not have starter lockout protection.
584	Starter relay driver circuit - Voltage above normal, or shorted to high source. Open circuit or high voltage detected at starter lockout circuit.	The engine will not have starter lockout protection.

Fault code No.	Reason	Effect (only when fault code is active)
585	Starter relay driver circuit - Voltage below normal, or shorted to low source. Low voltage detected at starter lockout circuit.	Engine power derate. The ECM uses an estimated turbocharger speed.
595	Turbocharger 1 speed - Data valid but above normal operational range - Moderately severe level. High turbocharger speed has been detected.	Amber lamp will light until high battery voltage condition is corrected.
599	Auxiliary commanded dual output shutdown - Special instructions.	None or possible engine noise associated with higher injection pressures (especially at idle or light load). Engine power is reduced.
687	Turbocharger 1 speed - Data valid but below normal operational range - Moderately severe level. Low turbocharger speed detected by the ECM.	Engine can run rough. Possibly poor starting capability. Engine runs using backup speed sensor. Engine power is reduced.
689	Engine crankshaft speed/position - Data erratic, intermittent, or incorrect. Loss of signal from crankshaft sensor.	Engine power derate.
691	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	Turbocharger 1 compressor inlet temperature circuit - Voltage below normal, or shorted to low source. Low signal voltage detected at turbocharger compressor inlet air tempera	Engine will run derated. Excessive black smoke, hard start, and rough idle possible.
731	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.	Possible no noticeable performance effects, engine dying, or hard starting.
757	Electronic control module data lost - Condition exists. Severe loss of data from the ECM.	Possible poor starting. Engine power derate.
778	Engine camshaft speed / position sensor - Data erratic, intermittent, or incorrect. The ECM has detected an error in the camshaft position sensor signal.	Possible engine power derate.
779	Auxiliary equipment sensor input 3 - Root cause not known.	Possible no noticeable performance effects or engine dying or hard starting. Fault information, trip information, and maintenance monitor data may be inaccurate.
1117	Power supply lost with ignition on - 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 (retain battery voltage for 30 seconds after key OFF).	Engine will shut down.
1633	OEM datalink cannot transmit - Data erratic, intermittent, or incorrect. Communications within the OEM datalink network is intermittent.	Engine will only idle.
2185	Sensor supply 4 circuit - Voltage above normal, or shorted to high source. High voltage detected at +5 volt sensor supply circuit to the accelerator pedal position sensor.	Engine will only idle.

Fault code No.	Reason	Effect (only when fault code is active)
2186	Sensor supply 4 circuit - Voltage below normal, or shorted to low source. Low voltage detected at +5 volt sensor supply circuit to the accelerator pedal position sensor.	Possibly hard to start, low power, or engine smoke.
2249	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.	Engine may be difficult to start.
2265	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	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.	Possible low power.
2311	Electronic fuel injection control valve circuit - Condition exists. Fuel pump actuator circuit resistance too high or too low.	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.
2321	Engine crankshaft speed/position - Data erratic, intermittent, or incorrect. crankshaft engine speed sensor intermittent synchronization.	Possible low power.
2322	Engine camshaft speed / position sensor - Data erratic, intermittent, or incorrect. Camshaft engine speed sensor intermittent synchronization.	Engine power derate.
2345	Turbocharger 1 Speed - Abnormal rate of change. The turbocharger speed sensor has detected an erroneous speed value.	Engine power derate.
2346	Turbocharger turbine inlet temperature (Calculated) - Data valid but above normal operational range - Least severe level. Turbocharger turbine inlet temperature has exceeded the engine protection limit.	Engine power derate.
2347	Turbocharger compressor outlet temperature (Calculated) - Data valid but above normal operational range - Least severe level.	Engine brake on cylinders 1, 2, and 3 can not be activated or exhaust brake will not operate.
2377	Fan control circuit - Voltage above normal, or shorted to high source. Open circuit or high voltage detected at the fan control circuit.	Variable geometry turbocharger will go to the open position.
2384	VGT actuator driver circuit - Voltage below normal, or shorted to low source. Low voltage detected at turbocharger control valve circuit.	Variable geometry turbocharger may be in either the open or closed position.
2385	VGT actuator driver circuit - Voltage above normal, or shorted to high source. Open circuit or high voltage detected at turbocharger control valve circuit.	The intake air heaters may be ON or OFF all the time.
2555	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 heaters may be ON or OFF all the time.
2556	Intake air heater 1 circuit - Voltage below normal, or shorted to low source. Low voltage detected at the intake air heater signal circuit.	Can not control transmission.
2557	Auxiliary PWM 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 No.	Reason	Effect (only when fault code is active)
2558	Auxiliary PWM driver 1 circuit - Voltage below normal, or shorted to low source. Low signal voltage detected at the analog torque circuit.	Power derate and possible engine shutdown if engine protection shutdown feature is enabled.
2973	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.	