ISUZU

2009/2010MY N SERIES

WORKSHOP MANUAL

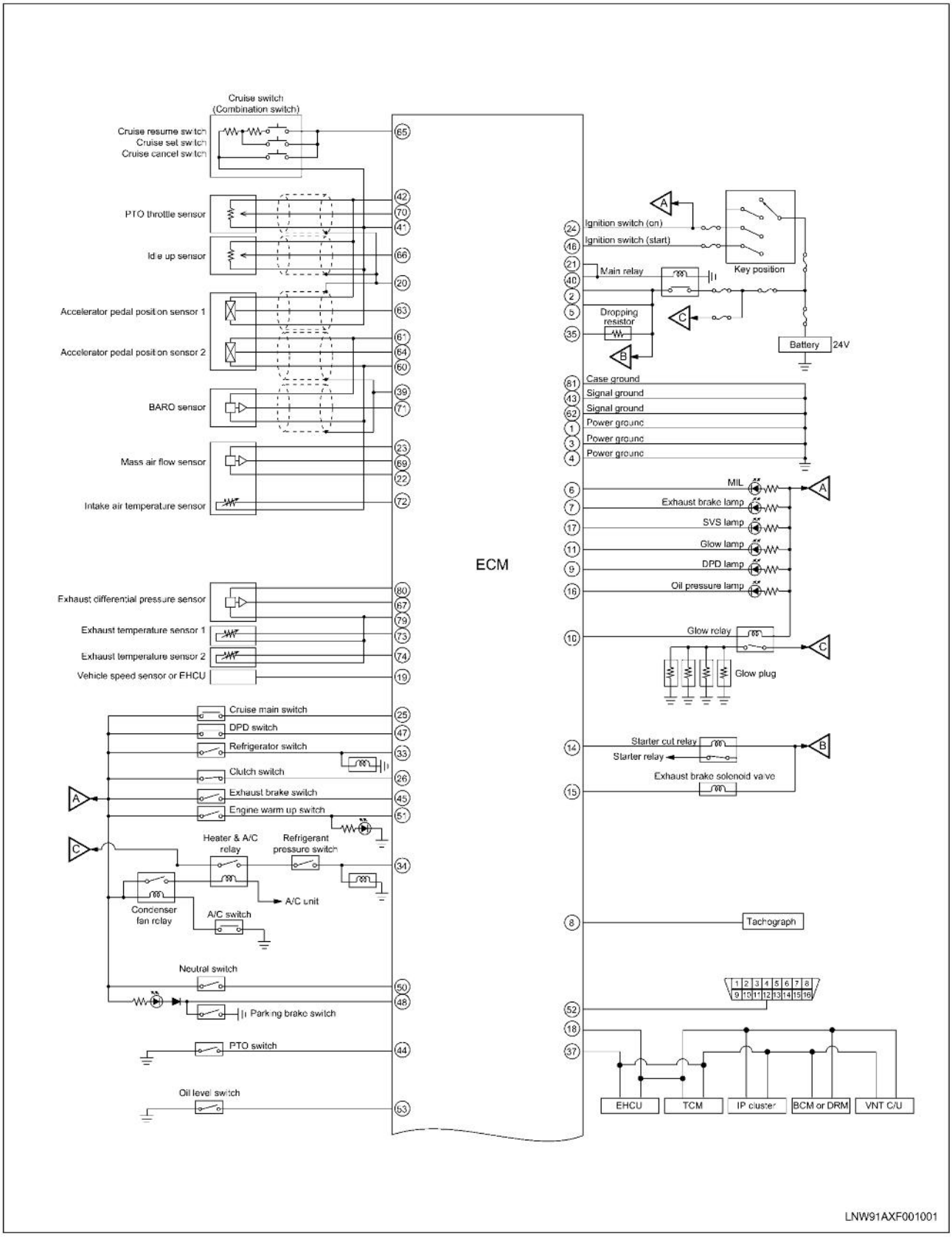
ENGINE CONTROL SYSTEM

(4HK1 model)

Overview Wirings

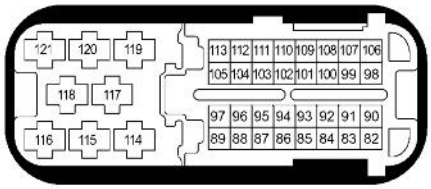
Overview Wirings

1/2



Connector No.		J14
Connector color		Black
Test adapter No.		J-35616-64A
Pin No.	Wire color	Pin function
45	LT GRN/ RED	Exhaust brake switch signal
46	BLK/ WHT	Ignition switch signal
47	BLU/ WHT	DPD regeneration switch signal
48	YEL	Parking brake switch signal
49	–	Not used
50	BLK/ GRN	Neutral switch signal
51	BRN/ RED	Engine warm up switch signal
52	BLK/ WHT	Diagnostic request switch
53	VIO/ YEL	Engine oil level switch signal
54	–	Not used
55	–	Not used
56	–	Not used
57	–	Not used
58	GRN/ WHT	CAN high signal
59	–	Not used
60	RED	APP sensor 2, BARO sensor and IAT sensor low reference
61	GRN	APP sensor 2 and BARO sensor 5 volts reference
62	BLK	ECM signal ground
63	BLU/ WHT	APP sensor 1 signal
64	WHT	APP sensor 2 signal
65	BRN/ BLU	Cruise control switch signal
66	YEL/ GRN	Idle up sensor signal
67	GRN/ YEL	Exhaust differential pressure sensor signal
68	BLK	Ground
69	WHT	MAF sensor signal
70	YEL	PTO throttle sensor signal
71	WHT/ RED	BARO sensor signal
72	BLU/ BLK	IAT sensor signal
73	YEL/ RED	Exhaust temperature sensor 1 signal
74	RED	Exhaust temperature sensor 2 signal

Connector No.		J14
Connector color		Black
Test adapter No.		J-35616-64A
Pin No.	Wire color	Pin function
75	–	Not used
76	–	Not used
77	–	Not used
78	GRN	CAN low signal
79	BLK	Exhaust differential pressure sensor, exhaust temperature sensor 1 and exhaust temperature sensor 2 low reference
80	WHT/ ORN	Exhaust differential pressure sensor 5 volts reference
81	BLK	ECM case ground

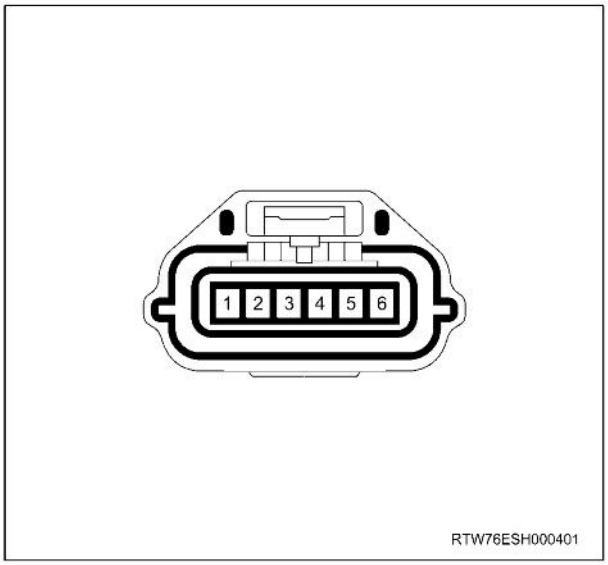


LNW76ESH001601

Connector No.		E12
Connector color		Black
Test adapter No.		J-35616-64A
Pin No.	Wire color	Pin function
82	BLU/ WHT	FRP sensor signal
83	LT GRN/ WHT	FT sensor signal
84	GRN/ YEL	ECT sensor signal
85	VIO/ WHT	Intake throttle position sensor signal
86	–	Not used

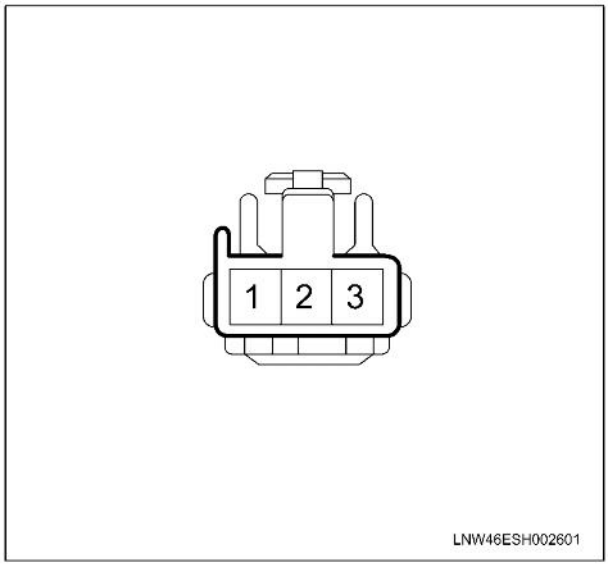
Connector No.		J38
Connector color		Black
Test adapter No.		J-35616-64A
Pin No.	Wire color	Pin function
3	WHT	MAF sensor signal
4	BLU/ BLK	IAT sensor signal
5	RED	IAT sensor low reference

Intake Throttle Valve



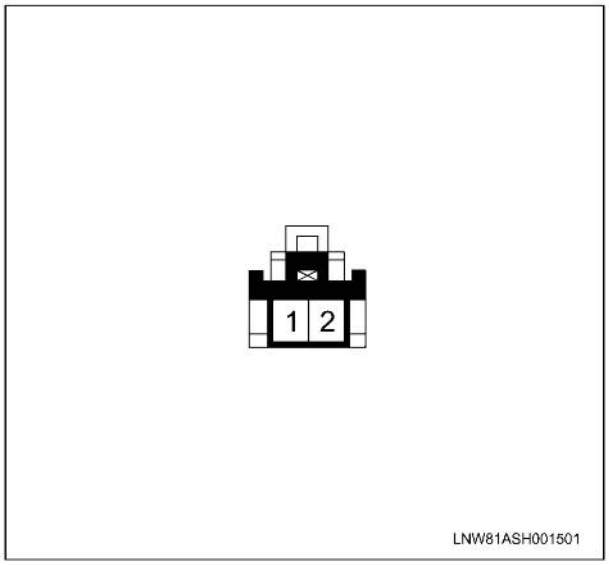
Connector No.		E16
Connector color		Black
Test adapter No.		J-35616-64A
Pin No.	Wire color	Pin function
1	GRY	Motor control low side (PWM)
2	BLK/ GRN	Motor drive voltage
3	GRN	Position sensor low reference
4	–	Not used
5	VIO/ WHT	Position sensor signal
6	YEL	Position sensor 5 volts reference

Idle Up Sensor



Connector No.		B87
Connector color		White
Test adapter No.		J-35616-33
Pin No.	Wire color	Pin function
1	BLU/ RED	Sensor low reference
2	YEL/ GRN	Sensor signal
3	BLU	Sensor 5 volts reference

PTO Switch



Scan Tool Parameter	Units Displayed	Typical Data Value at Engine Idle	Typical Data Value at 1700 RPM
Ignition Voltage	Volts	22.0 to 30.0 volts	22.0 to 30.0 volts
Battery Voltage	Volts	22.0 to 30.0 volts	22.0 to 30.0 volts
Clutch Pedal Switch	Applied/ Released	Applied or Released	Applied or Released
Neutral Switch	Neutral/ In Gear	Neutral	Neutral
Park Brake Switch	Applied/ Released	Applied or Released	Applied or Released
Exhaust Brake Switch	On/ Off	Off	Off
Exhaust Brake Valve Command	On/ Off	Off	Off
Exhaust Brake Cut Request from ABS Module	Inactive/ Active	Inactive	Inactive
Exhaust Brake Cut Request from TCM	Inactive/ Active	Inactive	Inactive
ASR Commanded APP (Accelerator Pedal Position)	%	100%	100%
PTO Switch	On/ Off	Off	Off
PTO Remote Throttle	%	0%	0%
PTO Remote Throttle Sensor	Volts	Less than 0.4 volts	Less than 0.4 volts
Engine Warm Up Switch	On/ Off	Off	Off
A/C Request Signal (Air Conditioning)	On/ Off	Off	Off
Refrigerator Switch	On/ Off	Off	Off
Oil Level	Normal/ Low	Normal	Normal
Glow Plug Relay Command	On/ Off	Off	Off
Malfunction Indicator Lamp (MIL)	On/ Off	Off	Off
Distance While MIL is Activated	km/ Miles	0 km/ 0 Miles	0 km/ 0 Miles
Engine Runtime With MIL Active	minutes	0	0
Vane Control Solenoid Error	No/ Stuck/ Short Circuit	No	No
Vane Position Sensor Error	No/ All Low/ All High	No	No
Turbocharger Control Module Error	No/ High Voltage	No	No
Total Engine Overspeed Events	Counter	Varies	Varies
Total Engine Coolant Overtemperature Event	Counter	Varies	Varies
Total Fuel Temperature Overtemperature Event	Counter	Varies	Varies

Scan Tool Does Not Power Up

Circuit Description

The data link connector (DLC) is a standardized 16-cavity connector. Connector design and location is dictated by an industry wide standard, and is required to provide the following:

- Scan tool power battery positive voltage at terminal 16.
- Scan tool power ground at terminal 4.
- Common signal ground at terminal 5.

The scan tool will power up with the ignition OFF. Some modules however, will not communicate unless the ignition is ON.

Connector End View Reference: Engine Controls Connector End Views or ECM Connector End Views

Circuit/ System Testing Scan Tool Does Not Power Up

Step	Action	Value(s)	Yes	No
1	**Important**: Make sure the scan tool and 24 volts adapter works properly on another vehicle before using this chart. 1. Turn OFF the ignition. 2. Inspect the Room Lamp, Audio (15A) fuse in the cabin fuse block. Is the Room Lamp, Audio (15A) fuse open?	—	Go to Step 2	Go to Step 3
2	Replace the Room Lamp, Audio (15A) fuse. If the fuse continues to open, repair the short to ground on one of the circuits that is fed by the Room Lamp, Audio (15A) fuse or replace the shorted attached component. Did you complete the repair?	—	Go to Step 7	—
3	1. Check each circuit at the data link connector (DLC) (B31) for a backed out, spread or missing terminal. 2. Repair the terminal as necessary. Did you find and complete the repair?	—	Go to Step 7	Go to Step 4
4	Connect a test lamp between the +B circuit (pin 16 of B31) at the DLC and a known good ground. Does the test lamp illuminate?	—	Go to Step 6	Go to Step 5
5	Repair the open in the battery voltage circuit to the DLC. Did you complete the repair?	—	Go to Step 7	—
6	1. Test each ground circuit at the DLC (pins 4 and 5 of B31) for an open circuit or high resistance. 2. Repair the circuit(s), clean or tighten ground as necessary. Did you find and correct the condition?	—	Go to Step 7	Go to Intermittent Conditions
7	1. Connect the scan tool to the DLC. 2. Attempt to turn ON the scan tool. Does the scan tool ON?	—	System OK	Go to Step 1

Step	Action	Value(s)	Yes	No
5	1. Inspect the turbocharger assembly for the following conditions: • Physical damage of turbocharger • Turbocharger nozzle control linkage damaged • Physical damage of VNT actuator & sensor • Loose or improper installation of VNT actuator & sensor 2. Repair or replace as necessary. Did you find and correct the condition?	—	Go to Step 20	Go to Step 6
6	1. Turn OFF the ignition. 2. Disconnect the VNT actuator & sensor harness connector. 3. Connect a test lamp between the each solenoid circuit (pins 6, 7 and 8 of E2) and a known good ground. 4. Turn ON the ignition, with the engine OFF. **Notice:** Ignition switch must be cycled when the test lamp is probed to other positions. Is there circuit which did not illuminate, or continuously illuminate the test lamp (note that the test lamp illuminate then go out normally)?	—	Go to Step 8	Go to Step 7
7	1. Test the solenoid circuit between the VNT control module (pins 10, 11 and 12 of J247) and the actuator & sensor (pins 6, 7 and 8 of E2) for a short circuit each other. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 20	Go to Step 16
8	1. Test the solenoid circuits (which ever circuit did not illuminate, or continuously illuminate at Step 6) between the VNT control module (pins 10, 11 and 12 of J247) and the actuator & sensor (pins 6, 7 and 8 of E2) for the following conditions: • An open circuit • A short to ground • A short to battery or ignition voltage • A short to the position sensor circuit • High resistance 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 20	Go to Step 17
9	1. Turn OFF the ignition. 2. Connect a DMM between the position sensor reference voltage circuit (pin 1 of E2) and a known good ground. 3. Turn ON the ignition, with the engine OFF. Is the DMM voltage within the specified value?	8.0 to 10.0 volts	Go to Step 10	Go to Step 13

Step	Action	Value(s)	Yes	No
16	**Important**: The fuel supply pump must be timed to the engine and adjustment value must be learned to the ECM. **Notice:** Always replace the fuel filter element when a fuel supply pump is replaced. Replace the fuel supply pump and fuel filter element. Refer to Fuel Supply Pump and Fuel Filter Element in Section 1D Engine Fuel. Did you complete the replacement?	—	Go to Step 17	—
17	1. Reconnect all previously disconnected harness connector(s). 2. Clear the DTCs with a scan tool. 3. Turn OFF the ignition for 30 seconds. 4. Start the engine. 5. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/ Failure Records. Did the DTC fail this ignition?	—	Go to Step 2	Go to Step 18
18	Observe the DTC Information with a scan tool. Are there any DTCs that you have not diagnosed?	—	Go to DTC List	System OK

Step	Action	Value(s)	Yes	No
5	1. Turn OFF the ignition. 2. Disconnect the FRP regulator harness connector. 3. Connect a test lamp between the high side circuit (pin 1 of E17) and a known good ground. 4. Turn ON the ignition, with the engine OFF. Does the test lamp illuminate?	—	Go to Step 6	Go to Step 9
6	1. Turn OFF the ignition. 2. Connect a test lamp between the low side circuit (pin 2 of E17) and battery voltage. 3. Turn ON the ignition, with the engine OFF. Does the test lamp illuminate?	—	Go to Step 11	Go to Step 10
7	1. Test the high side circuits between the ECM (pins 105 and 113 of E12) and the FRP regulator (pin 1 of E17) for a short to battery or ignition voltage. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 15	Go to Step 14
8	1. Test the low side circuits between the ECM (pins 89 and 97 of E12) and the FRP regulator (pin 2 of E17) for a short to ground. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 15	Go to Step 14
9	1. Test the high side circuits between the ECM (pins 105 and 113 of E12) and the FRP regulator (pin 1 of E17) for the following conditions: • An open circuit • A short to ground • A short to the low side circuit • High resistance 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 15	Go to Step 12
10	**Important:** The ECM may be damaged if the FRP regulator low side circuit is shorted to a voltage source. 1. Test the low side circuits between the ECM (pins 89 and 97 of E12) and the FRP regulator (pin 2 of E17) for the following conditions: • An open circuit • A short to battery or ignition voltage • High resistance 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 15	Go to Step 12
11	1. Inspect for an intermittent and for poor connections at the harness connector of the FRP regulator (pins 1 and 2 of E17). 2. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 15	Go to Step 13

Step	Action	Value(s)	Yes	No
6	1. Reconnect all previously disconnected harness connector(s). 2. Clear the DTCs with a scan tool. 3. Turn OFF the ignition for 30 seconds. 4. Start the engine. 5. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/ Failure Records. Did the DTC fail this ignition?	—	Go to Step 2	Go to Step 7
7	Observe the DTC Information with a scan tool. Are there any DTCs that you have not diagnosed?	—	Go to DTC List	System OK

Step	Action	Value(s)	Yes	No
4	1. Test each sensor circuit between the ECM (pins 84 and 109 of E12) and the ECT sensor (pins 1 and 2 of E25) for high resistance. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 6	Go to Step 5
5	Replace the ECT sensor. Refer to ECT Sensor in Section 1C Engine Cooling. Did you complete the replacement?	—	Go to Step 6	—
6	1. Reconnect all previously disconnected harness connector(s). 2. Clear the DTCs with a scan tool. 3. Turn OFF the ignition for 30 seconds. 4. Start the engine. 5. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/ Failure Records. Did the DTC fail this ignition?	—	Go to Step 2	Go to Step 7
7	Observe the DTC Information with a scan tool. Are there any DTCs that you have not diagnosed?	—	Go to DTC List	System OK

Step	Action	Value(s)	Yes	No
5	1. Test the signal circuit between the ECM (pin 83 of E12) and the FT sensor (pin 2 of E22) for the following conditions: • A short to ground • A short to the low reference circuit 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 9	Go to Step 7
6	Replace the FT sensor. Refer to FT Sensor in Section 1D Engine Fuel. Did you complete the replacement?	—	Go to Step 9	—
7	1. Turn OFF the ignition. 2. Disconnect the ECM harness connector. 3. Inspect connections at the harness connector of the ECM (pins 83 and 109 of E12) for corrosion. 4. Repair or clean the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 9	Go to Step 8
8	**Important:** Replacement ECM must be programmed and learned. Replace the ECM. Refer to ECM Replacement. Did you complete the replacement?	—	Go to Step 9	—
9	1. Reconnect all previously disconnected harness connector(s). 2. Clear the DTCs with a scan tool. 3. Turn OFF the ignition for 30 seconds. 4. Start the engine. 5. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/ Failure Records. Did the DTC fail this ignition?	—	Go to Step 3	Go to Step 10
10	Observe the DTC Information with a scan tool. Are there any DTCs that you have not diagnosed?	—	Go to DTC List	System OK

Circuit/ System Testing DTC P0183 (Flash Code 211)

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Engine Controls?	—	Go to Step 2	Go to Diagnostic System Check - Engine Controls
2	1. Install a scan tool. 2. Turn OFF the ignition for 30 seconds. 3. Start the engine. 4. Monitor the DTC Information with a scan tool. Is DTC P0697 also set?	—	Go to DTC P0697	Go to Step 3

Step	Action	Value(s)	Yes	No
4	Connect a DMM between the cylinder #2 solenoid control circuit (pin 6 of H69 female side) and a known good ground. Is the DMM voltage less than the specified value?	16.0 volts	Go to Step 5	Go to Step 9
5	Is the DMM voltage more than the specified value at Step 4?	12.0 volts	Go to Step 6	Go to Step 10
6	1. Inspect for an intermittent and for poor connections at the in-line harness connector (pins 2 and 6 of H69). 2. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 15	Go to Step 7
7	1. Remove the cylinder head cover. Refer to Cylinder Head Cover in Section 1B Engine Mechanical. 2. Inspect the fuel injector harness for loose injector terminal nuts, objects touching injector terminals. 3. Inspect for an intermittent and for poor connections at the in-line harness connector (pins 2 and 6 of H150). 4. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 15	Go to Step 11
8	1. Test the control circuit between the ECM (pin 118 of E12) and the in-line harness connector (pin 6 of H69 female side) for a short to the common 2 charge voltage circuit. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 15	Go to Step 13
9	1. Test the control circuit between the ECM (pin 118 of E12) and the in-line harness connector (pin 6 of H69 female side) for a short to battery or ignition voltage. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 15	Go to Step 13
10	1. Test the control circuit between the ECM (pin 118 of E12) and the in-line harness connector (pin 6 of H69 female side) for an open circuit or high resistance. 2. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 15	Go to Step 12
11	1. Test the cylinder #2 fuel injector circuits between the fuel injector terminals (pins 1, 2 and 3 of E139) and the in-line harness connector (pins 2 and 6 of H150) for the following conditions: • An open circuit • A short circuit each other • High resistance 2. Repair the circuit(s) or replace the fuel injector harness as necessary. Did you find and correct the condition?	—	Go to Step 15	Go to Step 13

DTC P0234 (Flash Code 42)

Turbocharger Overboost Condition

Circuit Description

The boost pressure sensor is located in the air induction tubing. The sensor is a transducer that varies voltage according to changes in the air pressure inside the air tubing. The ECM monitors the boost pressure sensor signal for abnormal values. If the ECM detects that the sensor signal is excessively high, this DTC will set. This indicates excessive high boost pressure.

Condition for Running the DTC

- DTCs P0045, P0237, P0238, P060B, P0697, U0073 and U0110 are not set.
- The ignition switch is ON.

Condition for Setting the DTC

- The ECM detects an excessive boost pressure for longer than 5 seconds.

Action Taken When the DTC Sets

- The ECM illuminates the MIL when the diagnostic runs and fails. Refer to DTC Type Definitions for Action Taken When the DTC Sets - Type A.
- The ECM limits fuel injection quantity
- The ECM inhibits EGR control.
- The ECM inhibits cruise control.

Condition for Clearing the DTC

- Refer to DTC Type Definitions for Condition for Clearing the MIL/ DTC - Type A.

Diagnostic Aids

- An open circuit or high resistance in the boost pressure low reference circuit may set this DTC.
- Check the turbocharger nozzle control solenoid valve for a sticking.
- Use a scan tool to verify the integrity of the boost pressure sensor signal. Compare the sensor values under all load conditions for an excessively high value.
- The fuel with which gasoline was mixed may set this DTC.

Test Description

The numbers below refer to the step number on the Circuit/ System Testing.
3. A skewed boost pressure sensor value (shifted to a higher pressure) can set this DTC. The Boost Pressure on the scan tool should read near Barometric Pressure (BARO) with the ignition switch ON and engine OFF.
4. A skewed BARO sensor value (shifted to a lower pressure) may indicate a wrong boost pressure. The BARO on the scan tool should read near surrounding barometric pressure.

Connector End View Reference: Engine Controls Connector End Views or ECM Connector End Views

Circuit/ System Testing DTC P0234 (Flash Code 42)

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Engine Controls?	—	Go to Step 2	Go to Diagnostic System Check - Engine Controls
2	1. Install a scan tool. 2. Turn OFF the ignition for 30 seconds. 3. Start the engine. 4. Monitor the DTC Information with a scan tool. Is DTC P0045, P0237, P0238, P0638, P2227, P2228 or P2229 also set?	—	Go to Applicable DTC	Go to Step 3
3	1. Turn ON the ignition, with the engine OFF. 2. Observe the Boost Pressure and Barometric Pressure (BARO) with a scan tool. Does the scan tool indicate that the difference between the Boost Pressure and BARO is more than the specified value?	10 kPa (1.5 psi)	Go to Step 4	Go to Step 5
4	Compare the BARO value to the range specified in the altitude vs. barometric pressure table. Refer to Altitude vs Barometric Pressure. Is the BARO parameter within the range specified?	—	Go to Step 6	Go to Step 7

DTC P0335 (Flash Code 15)

Crankshaft Position Sensor Circuit

Circuit Description

The crankshaft position (CKP) sensor is located on the flywheel housing. The sensor rotor is fixed on the flywheel. There are 56 notches spaced 6° apart and a 30° section that is open span. This open span portion allows for the detection of top dead center (TDC). The CKP sensor is a magnetic resistance element (MRE) type sensor, which generates a square wave signal pulse. The sensor has the following circuits.

- 5 volts reference circuit
- Low reference circuit
- CKP sensor signal circuit

The ECM monitors both CKP sensor and camshaft position (CMP) sensor signal pulses to ensure they correlate with each other. If the ECM receives a certain amount of CMP sensor signal pulses without a CKP sensor signal pulse, this DTC will set.

Condition for Running the DTC

- DTCs P0016, P0336, P0340 and P0341 are not set.
- The ignition switch is ON.
- The CMP sensor signal pulse is detected.

Condition for Setting the DTC

- The ECM detects that the CKP sensor signal pulses are not generated during engine rotations.

Action Taken When the DTC Sets

- The ECM illuminates the MIL when the diagnostic runs and fails. Refer to DTC Type Definitions for Action Taken When the DTC Sets - Type A.

Condition for Clearing the DTC

- Refer to DTC Type Definitions for Condition for Clearing the MIL/ DTC - Type A.

Diagnostic Aids

- If an intermittent condition is suspected, refer to Intermittent Conditions in this section.
- Electromagnetic interference in the CKP sensor circuits may set this DTC.
- An intermittent CKP sensor signal pulse may set this DTC.
- Ensure the sensor is tight and the sensor rotor teeth are not damaged.

Notice: If the CKP sensor signal pulse is lost while running, the engine will stop.

Connector End View Reference: Engine Controls Connector End Views or ECM Connector End Views

Circuit/ System Testing DTC P0335 (Flash Code 15)

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Engine Controls?	—	Go to Step 2	Go to Diagnostic System Check - Engine Controls
2	1. Install a scan tool. 2. Turn OFF the ignition for 30 seconds. 3. Start the engine (Note a slight start delay may be noticed). 4. Monitor the DTC Information with a scan tool. Does the DTC fail this ignition?	—	Go to Step 3	Go to Diagnostic Aids
3	Is DTC P0340, P0341 or P0697 also set?	—	Go to Applicable DTC	Go to Step 4
4	1. Turn OFF the ignition. 2. Disconnect the crankshaft position (CKP) sensor harness connector. 3. Connect a DMM between the 5 volts reference circuit (pin 3 of E20) and a known good ground. 4. Turn ON the ignition, with the engine OFF. Is the DMM voltage more than the specified value?	4.5 volts	Go to Step 5	Go to Step 9

DTC P0380 (Flash Code 66)

Glow Plug Circuit

Circuit Description

The ECM controls the glow relay which supplies power to the glow plugs based on engine coolant temperature. In the after glow phase, the glow plug lamp is not illuminated but glow plugs remain active for a certain period. If the ECM detects an open circuit or short circuit on the relay control circuit, this DTC will set.

Condition for Running the DTC

- The battery voltage is between 18 to 32 volts.
- The ignition switch is ON.

Condition for Setting the DTC

Either of following condition is met:

- The ECM detects a low voltage condition on the glow relay control circuit for longer than 3 second when the relay is commanded OFF.
- The ECM detects a high voltage condition on the glow relay control circuit for longer than 3 second when the relay is commanded ON.

Action Taken When the DTC Sets

- The ECM illuminates the SVS lamp when the diagnostic runs and fails. Refer to DTC Type Definitions for Action Taken When the DTC Sets - Type C.

Condition for Clearing the DTC

- Refer to DTC Type Definitions for Condition for Clearing the SVS Lamp/ DTC - Type C.

Diagnostic Aids

- If an intermittent condition is suspected, refer to Intermittent Conditions in this section.

Test Description

The numbers below refers to the step number on the Circuit/ System Testing.
2. Listen for an audible click when the glow relay operates. Command both the ON and OFF states.

Connector End View Reference: Engine Controls Connector End Views or ECM Connector End Views

Circuit/ System Testing DTC P0380 (Flash Code 66)

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Engine Controls?	—	Go to Step 2	Go to Diagnostic System Check - Engine Controls
2	1. Install a scan tool. 2. Perform the Glow Relay Control with a scan tool. 3. Command the relay ON and OFF. Does the glow relay click with each command?	—	Go to Diagnostic Aids	Go to Step 3
3	1. Turn OFF the ignition. 2. Replace the glow relay with the starter relay or replace with a known good relay. 3. Command the relay ON and OFF. Does the glow relay click with each command?	—	Go to Step 7	Go to Step 4
4	1. Turn OFF the ignition. 2. Remove the glow relay. 3. Turn ON the ignition, with the engine OFF. 4. Probe the ignition voltage feed circuit of the relay coil side (pin 3 of X19) with a test lamp that is connected to a known good ground. Does the test lamp illuminate?	—	Go to Step 5	Go to Step 6

Step	Action	Value(s)	Yes	No
9	**Important:** Replacement ECM must be programmed and learned. Replace the ECM. Refer to ECM Replacement. Did you complete the replacement?	—	Go to Step 10	—
10	1. Reconnect all previously disconnected harness connector(s). 2. Clear the DTCs with a scan tool. **Notice:** A history DTC will not clear. 3. Turn OFF the ignition for 30 seconds. 4. Start the engine. 5. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/ Failure Records. Did the DTC fail this ignition?	—	Go to Step 2	Go to Step 11
11	Observe the DTC Information with a scan tool. Are there any DTCs that you have not diagnosed?	—	Go to DTC List	System OK

Step	Action	Value(s)	Yes	No
16	Observe the DTC Information with a scan tool. Are there any DTCs that you have not diagnosed?	—	Go to DTC List	System OK

Circuit/ System Testing DTC P0478 (Flash Code 46)

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Engine Controls?	—	Go to Step 2	Go to Diagnostic System Check - Engine Controls
2	1. Install a scan tool. 2. Perform the Exhaust Brake Control with a scan tool. 3. Command the solenoid valve ON and OFF. Does the solenoid valve click with each command?	—	Go to Diagnostic Aids	Go to Step 3
3	1. Turn OFF the ignition. 2. Disconnect the exhaust brake solenoid valve harness connector. 3. Turn ON the ignition, with the engine OFF. 4. Monitor the DTC Information with a scan tool. Is DTC P0477 set, but not P0478?	—	Go to Step 5	Go to Step 4
4	1. Test the control circuit between the ECM (pin 15 of J14) and the solenoid valve (pin 2 of J26) for a short to battery or ignition voltage. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 7	Go to Step 6
5	Replace the exhaust brake solenoid valve. Did you complete the replacement?	—	Go to Step 7	—
6	**Important:** Replacement ECM must be programmed and learned. Replace the ECM. Refer to ECM Replacement. Did you complete the replacement?	—	Go to Step 7	—
7	1. Reconnect all previously disconnected harness connector(s). 2. Clear the DTCs with a scan tool. 3. Perform the Exhaust Brake Control with a scan tool. 4. Command the solenoid valve ON and OFF. Does the solenoid valve click with each command?	—	Go to Step 8	Go to Step 3
8	Observe the DTC Information with a scan tool. Are there any DTCs that you have not diagnosed?	—	Go to DTC List	System OK

DTC P0560 (Flash Code 155)

System Voltage

Circuit Description

The ECM provides 12 volts reference voltage to the mass air flow (MAF) sensor. Battery voltage is supplied in ECM through the dropping resistor, and it is converted into 12 volts. The ECM monitors the voltage on the 12 volts reference circuit. If the ECM detects the voltage is excessively low or high, this DTC will set.

Condition for Running the DTC

- DTC P060B is not set.
- The battery voltage is between 18 to 32 volts.
- The ignition switch is ON.

Condition for Setting the DTC

Either of following condition is met:

- The ECM detects that the 12 volts reference circuit voltage is less than 7 volts.
- The ECM detects that the 12 volts reference circuit voltage more than 19 volts.

Action Taken When the DTC Sets

- The ECM illuminates the MIL when the diagnostic runs and fails. Refer to DTC Type Definitions for Action Taken When the DTC Sets - Type A.
- The ECM limits fuel injection quantity.
- The ECM inhibits cruise control.

Condition for Clearing the DTC

- Refer to DTC Type Definitions for Condition for Clearing the MIL/ DTC - Type A.

Diagnostic Aids

- If an intermittent condition is suspected, refer to Intermittent Conditions in this section.

Connector End View Reference: Engine Controls Connector End Views or ECM Connector End Views

Circuit/ System Testing DTC P0560 (Flash Code 155)

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Engine Controls?	—	Go to Step 2	Go to Diagnostic System Check - Engine Controls
2	1. Install a scan tool. 2. Turn OFF the ignition for 30 seconds. 3. Turn ON the ignition, with the engine OFF. 4. Monitor the DTC Information with a scan tool. Does the DTC fail this ignition?	—	Go to Step 3	Go to Diagnostic Aids
3	1. Turn OFF the ignition for 30 seconds. 2. Disconnect the MAF sensor harness connector. 3. Turn ON the ignition, with the engine OFF. Does the DTC fail?	—	Go to Step 4	Go to Step 13
4	1. Turn OFF the ignition for 30 seconds. 2. Leave the MAF sensor harness connector disconnected. 3. Disconnect the dropping resistor harness connector. 4. Turn ON the ignition, with the engine OFF. Does the DTC fail?	—	Go to Step 10	Go to Step 5
5	Measure the resistance across the dropping resistor. Is the resistance within the specified value?	45 to 55 Ω	Go to Step 6	Go to Step 15
6	1. Connect a DMM between the ignition voltage feed circuit (pin 1 of J30) and a known good ground. 2. Turn ON the ignition, with the engine OFF. Is the DMM voltage more than the specified value?	18.0 volts	Go to Step 7	Go to Step 8

Step	Action	Value(s)	Yes	No
4	1. Remove the intake duct that is connected to the intake throttle valve. 2. Inspect the intake throttle valve for the following conditions: • Restricted intake throttle valve by foreign materials • Excessive deposits at throttle bore • Bent butterfly valve **Notice:** Replace the intake throttle valve if there is any sticking. 3. Repair or replace as necessary. Did you find and correct the condition?	—	Go to Step 8	Go to Step 5
5	1. Turn OFF the ignition. 2. Disconnect the intake throttle valve harness connector. 3. Inspect for an intermittent, for poor connections and corrosion at the harness connector of the intake throttle valve (pins 1, 2, 3, 5 and 6 of E16). 4. Disconnect the ECM harness connector. 5. Inspect for an intermittent, for poor connections and corrosion on each intake throttle valve circuit at the harness connector of the ECM (pins 85, 95, 104, 109 and 112 of E12). 6. Test for an open circuit or high resistance on each circuit. 7. Repair the connection(s) or circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 8	Go to Step 6
6	1. Test the motor circuits between the ECM (pins 104 and 112 of E12) and the intake throttle valve (pins 1 and 2 of E16) for the following conditions: • A short to ground • A short to battery or ignition voltage • A short circuit each other • A short to the intake throttle position sensor circuit(s) 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 8	Go to Step 7
7	Replace the intake throttle valve. Refer to Intake Throttle Valve in Section 1B Engine Mechanical. Did you complete the replacement?	—	Go to Step 8	—

Step	Action	Value(s)	Yes	No
10	1. Test the 5 volts reference circuit 2 between the ECM (pin 61 of J14) and the following components for a short to battery or ignition voltage. • APP sensor 2 (pin 1 of B5) • BARO sensor (pin 3 of B121) 2. Test the 5 volts reference circuit 5 between the ECM (pin 87 of E12) and the following components for a short to battery or ignition voltage. • FRP sensor (pin 3 of E19) • CMP sensor (pin 3 of E18) • EGR valve position sensor (pin 1 of E15) 3. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 17	Go to Step 16
11	Replace the CMP sensor. Refer to CMP Sensor in Section 1B Engine Mechanical. Did you complete the replacement?	—	Go to Step 17	—
12	Replace the FRP sensor. Refer to Fuel Pressure Sensor in Section 1D Engine Fuel. Did you complete the replacement?	—	Go to Step 17	—
13	Replace the EGR valve. Refer to EGR Valve and EGR Cooler in Section 1F Emission Control. Did you complete the replacement?	—	Go to Step 17	—
14	Replace the BARO sensor. Refer to BARO Sensor Replacement. Did you complete the replacement?	—	Go to Step 17	—
15	Replace the APP sensor. Refer to Accelerator Pedal Sensor in Section 1I Engine Speed Control System. Did you complete the replacement?	—	Go to Step 17	—
16	**Important:** Replacement ECM must be programmed and learned. Replace the ECM. Refer to ECM Replacement. Did you complete the replacement?	—	Go to Step 17	—
17	1. Reconnect all previously disconnected harness connector(s). 2. Clear the DTCs with a scan tool. 3. Turn OFF the ignition for 30 seconds. 4. Start the engine. 5. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/ Failure Records. Did the DTC fail this ignition?	—	Go to Step 3	Go to Step 18
18	Observe the DTC Information with a scan tool. Are there any DTCs that you have not diagnosed?	—	Go to DTC List	System OK