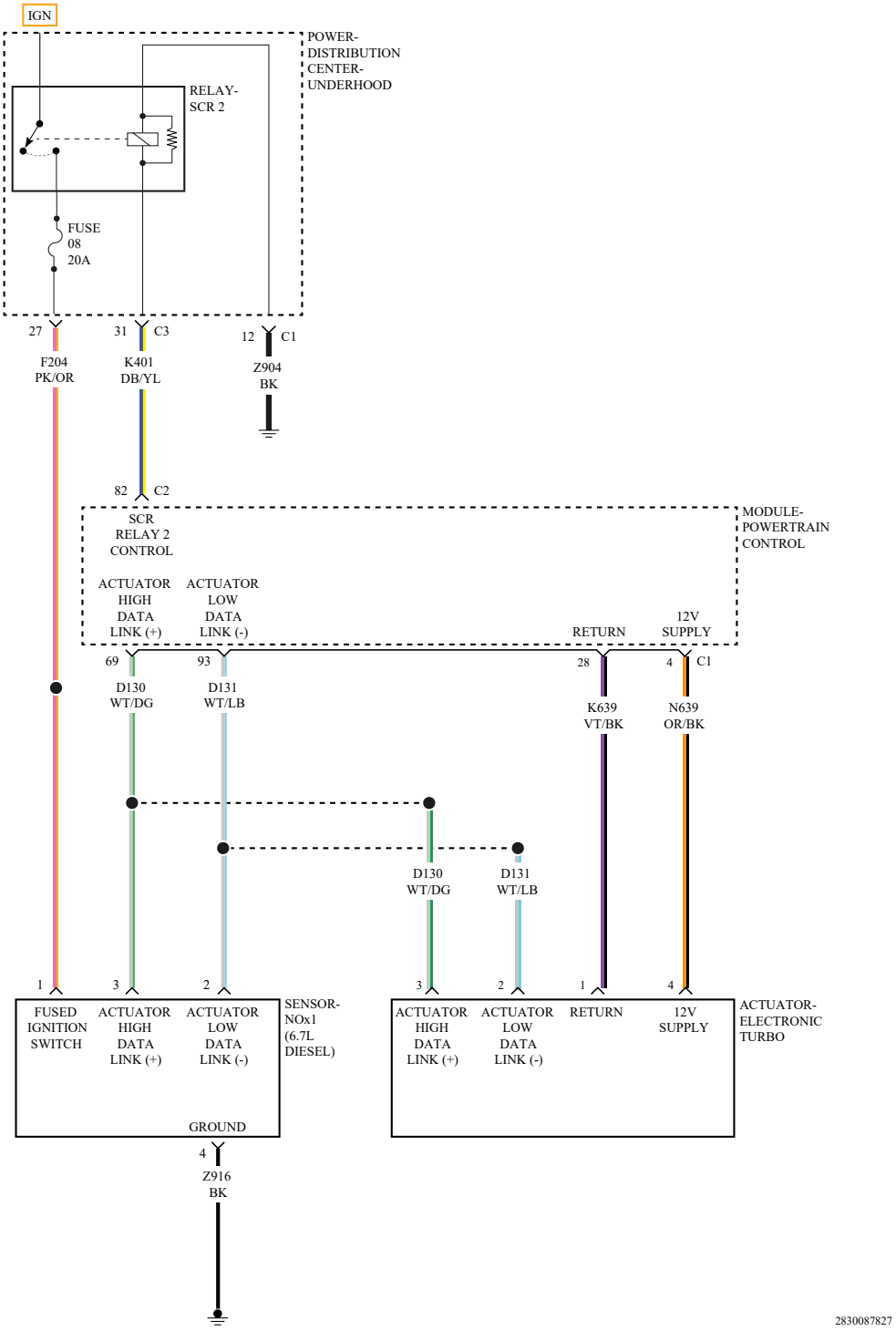
28 - DTC-Based Diagnostics / MODULE, Powertrain Control (PCM), 6.7L Diesel / Diagnosis and Testing

U010C-LOST COMMUNICATION WITH TURBOCHARGER/SUPERCHARGER CONTROL MODULE

For a complete wiring diagram, **refer to the Wiring Information**.


IGN
POWER-
DISTRIBUTION
CENTER-
UNDERHOOD
RELAY-
SCR 2
FUSE
08
20A
27
F204
PK/OR
31
C3
K401
DB/YL
12
C1
Z904
BK
82
C2
SCR
RELAY 2
CONTROL
ACTUATOR
HIGH
DATA
LINK (+)
ACTUATOR
LOW
DATA
LINK (-)
MODULE-
POWERTRAIN
CONTROL
RETURN
12V
SUPPLY
69
93
28
4
C1
D130
WT/DG
D131
WT/LB
K639
VT/BK
N639
OR/BK
D130
WT/DG
D131
WT/LB
1
3
2
3
2
1
4
FUSED
IGNITION
SWITCH
ACTUATOR
HIGH
DATA
LINK (+)
ACTUATOR
LOW
DATA
LINK (-)
SENSOR-
NOx1
(6.7L
DIESEL)
ACTUATOR
HIGH
DATA
LINK (+)
ACTUATOR
LOW
DATA
LINK (-)
RETURN
12V
SUPPLY
ACTUATOR-
ELECTRONIC
TURBO
GROUND
4
Z916
BK
2830087827

Theory of Operation

The Variable Geometry Turbocharger (VGT) is electronically controlled by the Electronic Turbo Actuator. The Electronic Turbo Actuator is a smart device; it communicates information with the Powertrain Control Module (PCM) over the J1939 BUS. The Electronic Turbo Actuator performs its own internal diagnostics and reports failures back to the PCM. The PCM then decodes the error message and converts it to a fault code. The PCM lights the Malfunction Indicator Lamp (MIL) after the diagnostic runs and fails in two consecutive drive cycles. The PCM will turn off the MIL immediately after this diagnostic runs and passes in four consecutive drive cycles.

- **When Monitored:**

  This Diagnostic starts running after 30 seconds of engine run time.

- **Set Condition:**

  The Powertrain Control Module (PCM) does not receive a message from the Turbo Actuator in a calibrated amount of time.

Possible Causes
VGT POWER SUPPLY OR RETURN CIRCUIT OPEN/HIGH RESISTANCE
J1939 DATALINK (+) CIRCUIT OPEN/HIGH RESISTANCE
J1939 DATALINK (-) CIRCUIT OPEN/HIGH RESISTANCE
J1939 DATALINK (+) CIRCUIT SHORTED TO BATTERY OR GROUND
J1939 DATALINK (-) CIRCUIT SHORTED TO BATTERY OR GROUND
J1939 DATALINK (+) CIRCUIT SHORTED TO ANOTHER CIRCUIT
J1939 DATALINK (-) CIRCUIT SHORTED TO ANOTHER CIRCUIT
J1939 DATALINK COMPONENT INTERNALLY SHORTED
ELECTRONIC TURBO ACTUATOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. **(Refer to 28 - DTC-Based Diagnostics/MODULE, Powertrain Control (PCM) - Standard Procedure).**

1. U010C ACTIVE

Is DTC U010C Active?

Yes

- Go To **2**

No

- Perform the INTERMITTENT CONDITION diagnostic procedure. (Refer to 28 - DTC-Based Diagnostics/MODULE, Powertrain Control (PCM) - Standard Procedure).

2. CHECK THE TERMINATING RESISTORS FOR THE DATALINK CIRCUITS

1. Turn the ignition off.
2. Verify that the Turbo Actuator harness connector and the PCM C1 harness connector are both fully connected.
3. Disconnect NOx Sensor 1/1 Module harness connector.
4. Measure the resistance between the (D131) Actuator Low Data (-) circuit and the (D130) Actuator High Data (+) circuit at the NOx Sensor 1/1 harness connector.

Is the resistance between 54 and 66 Ohms?

Yes

- Go To **9**

No

- If the resistance was between 108 and132 Ohms, again verify that the Turbo Actuator and PCM connectors were properly seated. If not, re-connect and re-test.
- If the resistance remains outside the desired resistance (54–66 Ohms), Go To **3**

3. CHECK THE ACTUATOR DATALINK CIRCUITS FOR A SHORT TO GROUND

1. Turn the ignition off.
2. Disconnect the Turbo Actuator harness connector.
3. Disconnect the NOx Sensor 1/1 Module harness connector.
4. Disconnect the PCM C1 harness connector.
5. Measure for continuity between ground and the (D131) Actuator Low Data (-) circuit at the PCM C1 harness connector.
6. Measure for continuity between ground and the (D130) Actuator High Data (+) circuit at the PCM C1 harness connector.

Is there continuity between ground and either Actuator circuit?

Yes

- Repair the Actuator circuit that has a short to ground.
- Perform the POWERTRAIN VERIFICATION TEST - 6.7L. (Refer to 28 - DTC-Based Diagnostics/MODULE, Powertrain Control (PCM) - Standard Procedure).

No

- Go To **4**

4. CHECK THE ACTUATOR DATALINK CIRCUITS FOR A SHORT TO OTHER PCM CONNECTOR CIRCUITS

1. Check for continuity between the (D131) Actuator Low Data (-) circuit and all other circuits at the PCM C1 harness connector.
2. Check for continuity between the (D130) Actuator Low Data (+) circuit and all other circuits at the PCM C1 harness connector.

Is there continuity between the Actuator Datalink circuits and any other PCM C1 circuits?

Yes

- Repair the Actuator circuit for a short to another PCM C1 circuit.
- Perform the POWERTRAIN VERIFICATION TEST - 6.7L. (Refer to 28 - DTC-Based Diagnostics/MODULE, Powertrain Control (PCM) - Standard Procedure).

No

- Go To **5**

5. CHECK THE TERMINATING RESISTOR IN THE ELECTRONIC TURBO ACTUATOR THROUGH THE DATALINK CIRCUITS

1. Reconnect the Turbo Actuator harness connector.
2. Verify that the NOx Sensor 1/1 harness connector is still disconnected.
3. Measure the resistance between the (D131) Actuator Low Data (-) circuit and the (D130) Actuator High Data (+) circuit, at the NOx 1/1 harness connector.

Is the resistance within specification (108-132 Ohms)?

Yes

- Go To **7**

No

- Go To **6**

6. CHECK THE TERMINATING RESISTOR IN THE ELECTRONIC TURBO ACTUATOR

NOTE: Check connectors - Clean/repair as necessary.

NOTE: When measuring resistance through the Datalink Terminating Resistor, the specification is between 108 and 132 ohms.

1. Measure the resistance of the Electronic Turbo Actuator Terminating Resistor between pins 2 and 3 at the Electronic Turbo Actuator (Actuator side).

Is the resistance within specification (108-132 Ohms)?

Yes

- Repair the Datalink circuit(s) for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST - 6.7L. (Refer to 28 - DTC-Based Diagnostics/MODULE, Powertrain Control (PCM) - Standard Procedure).

No

- Replace the Electronic Turbo Actuator in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST - 6.7L. (Refer to 28 - DTC-Based Diagnostics/MODULE, Powertrain Control (PCM) - Standard Procedure).

7. CHECK THE TERMINATING RESISTOR IN THE PCM THROUGH THE DATALINK CIRCUITS

1. Turn the ignition off.
2. Disconnect and isolate the negative battery cable.
3. Reconnect the PCM C1 harness connector.
4. Disconnect the Turbo Actuator harness connector.
5. Verify that the NOx Sensor 1/1 harness connector is still disconnected.

NOTE: Check connectors - Clean/repair as necessary.

NOTE: When measuring resistance through the Datalink Terminating Resistor, the specification is between 108 and 132 ohms.

6. Measure the resistance between the (D131) Actuator Low Data (-) circuit and the (D130) Actuator High Data (+) circuit, pins 2 and 3, at the Electronic Turbo Actuator harness connector.

Is the resistance within specification (108-132 Ohms)?

Yes

- Go To **9**

No

- Go To **8**

8. CHECK THE ACTUATOR DATALINK CIRCUITS FOR OPEN/HIGH RESISTANCE

1. Disconnect the PCM C1 harness connector.

NOTE: Check connectors - Clean/repair as necessary.

2. Measure the resistance of the (D131) Actuator Low Data (-) circuit between the Turbo Actuator harness connector and the PCM C1 harness connector.
3. Measure the resistance of the (D130) Actuator High Data (+) circuit between the Turbo Actuator harness connector and the PCM C1 harness connector.

Is the resistance below 3.0 Ohms for both circuits?

Yes

- Go To **13**

No

- Repair the Actuator Datalink circuit that measured above 3.0 Ohms for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST - 6.7L. (Refer to 28 - DTC-Based Diagnostics/MODULE, Powertrain Control (PCM) - Standard Procedure).

9. OTHER DTCS

NOTE: Repair any Voltage Low DTCs before proceeding with this test procedure.

NOTE: The J1939 Datalink is a BUS circuit which the PCM uses to communicate with the Ammonia Sensor, Turbo Actuator, DEF Dosing Control Unit, NOx Sensor 1/1, and NOx Sensor 1/2. The Turbo Actuator and NOx Sensor 1/1 are located on their own network in the engine harness. The Ammonia Sensor, DEF Dosing Control Unit, and NOx Sensor 1/2 are located on a separate network in the vehicle harness. If the J1939 Datalink in the engine harness is shorted, communication lost DTC's will be set against the Turbo Actuator and NOx Sensor 1/1. If the J1939 Datalink in the vehicle harness is shorted, communication lost DTCs will be set against the Ammonia Sensor, DEF Dosing Control Unit, and NOx Sensor 1/2. The Ammonia Sensor, NOx Sensor 1/1, and NOx Sensor 1/2 share the same fused battery supply circuit in the PDC.

All 3 sensors will lose communication and set DTCs if the fuse is blown. The Turbo Actuator and the DEF Dosing Control Unit have their own separate fused battery circuits in the PDC.

Are there lost communication DTCs present against both the Turbo Actuator and NOx Sensor 1/1?

Yes

- Go To **12**

No

- Go To **10**

10. CHECK THE POWER SUPPLY TO THE ELECTRONIC TURBO ACTUATOR FOR AN OPEN/HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the Electronic Turbo Actuator Connector.
3. Reconnect the PCM C1 harness connector.

NOTE: Check connectors - Clean/repair as necessary.

4. Ignition on, engine not running.

NOTE: Check the voltage during ignition on-engine off.

5. Measure the voltage of the Turbo Actuator Power Supply circuit at the Turbo Actuator harness connector.

Is the voltage above 11.0 Volts?

Yes

- Go To **11**

No

- Repair the Turbo Actuator 12-Volt Suppply circuit for an open/high resistance.
- Perform the POWERTRAIN VERIFICATION TEST - 6.7L. (Refer to 28 - DTC-Based Diagnostics/MODULE, Powertrain Control (PCM) - Standard Procedure).

11. CHECK THE ELECTRONIC TURBO ACTUATOR

1. Reconnect the Electronic Turbo Actuator Connector.
2. Reconnect the NOx Sensor 1/1 Connector.
3. Reconnect the negative battery cable

4. Turn the ignition on.
5. Using the scan tool, erase all DTCs.

NOTE: During the next Step, leave the ignition in the off position for 75 seconds and the engine idling for 45 seconds each time.

6. Using the scan tool, monitor for DTCs.
7. Start and idle the engine for 45 seconds

Did this DTC return?

Yes

- Replace the Electronic Turbo Actuator in accordance with the Service Information.
- Perform the POWERTRAIN VERIFICATION TEST - 6.7L. (Refer to 28 - DTC-Based Diagnostics/MODULE, Powertrain Control (PCM) - Standard Procedure).

No

- Disconnecting and reconnecting the harness connectors may have fixed the issue
- Perform the INTERMITTENT CONDITION diagnostic procedure. (Refer to 28 - DTC-Based Diagnostics/MODULE, Powertrain Control (PCM) - Standard Procedure).

12. CHECK THE COMPONENTS ON THE ACTUATOR DATALINK CIRCUITS

NOTE: **Disconnect only one component at a time during this next step. If the DTCs for the components that are STILL CONNECTED do not return to active or pending, the component that was disconnected is faulty. If all of the DTCs remain active or pending, then the disconnected component is not the problem. Reconnect each component before going on to the next one so that only one component is disconnected at a time.**

1. Turn the ignition off for 75 seconds.
2. Using the scan tool, erase all DTCs.
3. Disconnect the Turbo Actuator harness connector. Start and idle the engine for 45 seconds. Using the scan tool, monitor for the DTCs to return pending.

NOTE: **Monitor the status of the DTCs for the remaining connected components with the scan tool.**

4. Turn the ignition off and reconnect the Turbo Actuator harness connector.
5. Using the scan tool, erase all DTCs.
6. .Disconnect the NOx Sensor Module 1/1 harness connector. Star and idle the engine for 45 seconds. Using the scan tool, monitor for the DTCs to return pending.

NOTE: **Monitor the status of the DTCs for the remaining connected components with the scan tool.**

Did the status of the DTCs return to active or pending for the components STILL CONNECTED when

disconnecting any one of the components listed above?

Yes

- Go To **13**

No

- Replace the component that caused the DTC change from active to stored in accordance with the service information.
- Perform the POWERTRAIN VERIFICATION TEST - 6.7L. (Refer to 28 - DTC-Based Diagnostics/MODULE, Powertrain Control (PCM) - Standard Procedure).

13. POWERTRAIN CONTROL MODULE

1. Disconnect all PCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
   - Proper connector installation.
   - Damaged connector locks.
   - Corrosion.
   - Other signs of water intrusion.
   - Weather seal damage (if equipped).
   - Bent terminals.
   - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
   - Terminals that have been pushed back into the connector cavity.
   - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

   Repair any conditions that are found.
5. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Freeze Frame and Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read PCM DTCs.

Did the DTC return?

Yes

- Replace the Powertrain Control Module (PCM) in accordance with the Service Information. (Refer to 08 - Electrical/8E - Electronic Control Modules/MODULE, Powertrain Control/Removal) .

- Perform the POWERTRAIN VERIFICATION TEST - 6.7L. (Refer to 28 - DTC-Based Diagnostics/MODULE, Powertrain Control (PCM) - Standard Procedure).

No

- Test complete.
- Perform the POWERTRAIN VERIFICATION TEST - 6.7L. (Refer to 28 - DTC-Based Diagnostics/MODULE, Powertrain Control (PCM) - Standard Procedure).