

## **Section 31.3**

### **Troubleshooting Flash Code 31**

The following procedure will troubleshoot Flash Code 31. For all EGR related codes, always perform the basic checks in EGR-1. Refer to "10.16 Exhaust Gas Recirculation System (EGR-1) – Fault, Series 50 Engine" . For EGR troubleshooting, refer to "31.3.11 Check for Open Ground" .

#### **Section 31.3.1**

##### **Check Configuration**

Perform the following steps to check configuration.

1. If the unit has engine brakes, refer to "31.3.2 Determine Failure Mode" .
2. If the unit does not have engine brakes, the ECM is configured for engine brakes and shouldn't be. Contact DDC with the engine serial number to have the data changed. Reprogram the ECM after the change. Refer to "31.3.10 Verify Repairs" .

#### **Section 31.3.2**

##### **Determine Failure Mode**

Perform the following steps to determine failure mode.

1. Turn vehicle ignition ON.
2. Plug the diagnostic data reader (DDR) into the diagnostic data link (DDL) connector.
3. Read SAE code (051 or 052).
  - a. If the reading is FMI=3, there is an open. Refer to "31.3.3 Determine Engine Type" .
  - b. If the reading is FMI=4, there is a short to ground. Refer to "31.3.7 Check for Short" .

#### **Section 31.3.3**

##### **Determine Engine Type**

Perform the following steps to determine engine type.

1. Is this a Series 55 engine?
  - a. If yes, reprogram the ECM. Then, refer to "31.3.10 Verify Repairs" .
  - b. If no, refer to "31.3.4 Check for Open" .

#### **Section 31.3.4**

##### **Check for Open**

Perform the following steps to check for open.

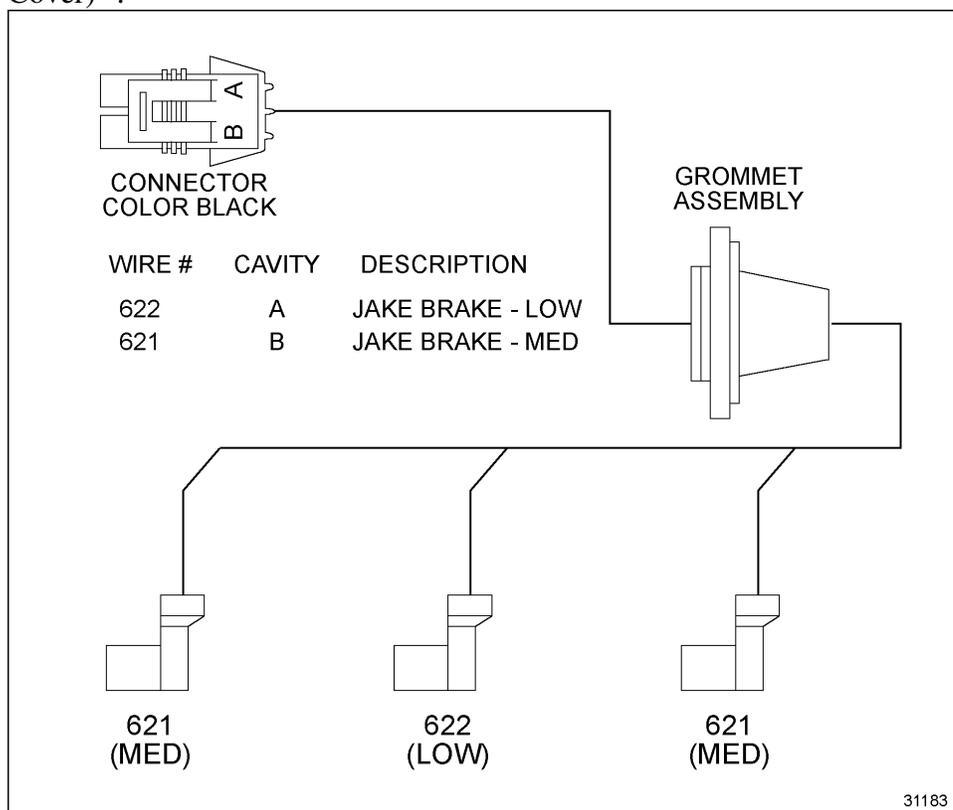
1. Turn vehicle ignition OFF.
2. Disconnect 2-pin connector pigtail from engine brake harness.
3. Disconnect 30-pin engine harness connector.
4. Install a jumper wire between pins #561 and #562, ECM side of pigtail.
5. Measure resistance between S3 (#561) and T3 (#562) of the engine harness connector.
  - a. If measured resistance is less than 50  $\Omega$ , refer to "31.3.5 Check for Open (Inside Valve Cover)" .
  - b. If measured resistance is greater than 50  $\Omega$ , one or both wires are open. Repair open. Refer

to "31.3.10 Verify Repairs" .

### Section 31.3.5 Check for Open (Inside Valve Cover)

Perform the following steps to check for open in the inside valve cover.

1. Reconnect the engine harness connector. See Figure "Engine Brake Harness Schematic" .
2. Relocate the jumper to pins A and B of the brake harness connector (brake side).
3. Remove rocker cover.
4. Disconnect the two #621 leads and the one #622 lead from the brake solenoids.
5. Measure resistance between both #621 wires and #622 wire.
  - a. If measured resistance is greater than 50  $\Omega$  or open, an open exists in one of the wires where the check was made. Repair open or replace the injector harness. Refer to "31.3.10 Verify Repairs" .
  - b. If measured resistance is less than 50  $\Omega$ , refer to "31.3.5 Check for Open (Inside Valve Cover)" .



*Figure 1. Engine Brake Harness Schematic*

### Section 31.3.6 Check for Cylinder Block Ground

Perform the following steps to check for cylinder block ground.

1. If the cylinder block is connected to the battery ground, refer to "31.3.5 Check for Open (Inside Valve Cover)" .
2. If the cylinder block is not connected to the battery ground, install a ground strap from the

cylinder block to the battery negative (-). Refer to "31.3.10 Verify Repairs" .

### **Section 31.3.7** **Check for Short**

Perform the following steps to check for a short.

1. Turn vehicle ignition OFF and unplug the engine harness connector.
2. Measure resistance between S3 (#561) and a battery ground, and S3 (#561) and the engine block. Repeat this check between T3 (#562) and battery ground, and T3 (#562) and the engine block.
  - a. If resistance for all measurements is greater than 5  $\Omega$  or open, refer to "31.3.8 Check for Short" .
  - b. If any measured resistance is less than 5  $\Omega$ , the wire where the measurement was read is shorted to ground or to the engine. Repair short or replace the wire. Refer to "31.3.10 Verify Repairs" .

### **Section 31.3.8** **Check for Short**

Perform the following steps to check for a short between wires.

1. Measure resistance between S3 (#561) and T3 (#562).
  - a. If measured resistance is less than 10  $\Omega$ , the S3 and T3 wires are shorted to each other. Repair short. Refer to "31.3.10 Verify Repairs" .
  - b. If measured resistance is greater than 10  $\Omega$ , refer to "31.3.9 Check Brake Solenoids" .

### **Section 31.3.9** **Check Brake Solenoids**

Perform the following steps to check for brake solenoids.

1. Check brake solenoids. Refer to OEM guidelines.
  - a. If the solenoids are in good condition, contact Detroit Diesel Technical Service. Refer to "31.3.10 Verify Repairs" .
  - b. If the solenoids are damaged, repair or replace them. Refer to "31.3.10 Verify Repairs" .

### **Section 31.3.10** **Verify Repairs**

Perform the following steps to verify repairs.

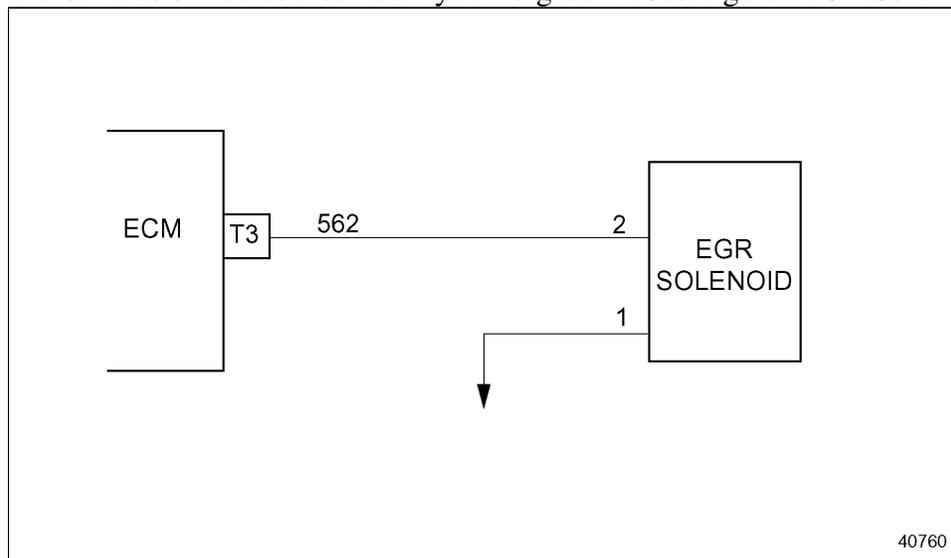
1. Connect any connectors removed for troubleshooting.
2. Start and run the engine. (Operate the engine brake.)
  - a. If no lights come on, and no codes are logged, the repairs are complete. No further troubleshooting is required.
  - b. If Check Engine Light displays with codes s 051/3, 51/4, 052/3, or 051/4, review this section to find the error. Refer to "31.3.1 Check Configuration" .

### **Section 31.3.11** **Check for Open Ground**

For all EGR related codes, always perform the basic checks in EGR-1 first. All tests in EGR-1 must pass before continuing with these procedures. Perform the following steps to check for open code 52/3):

**Note:** For code 51/3, refer to "31.3.13 Check Ground for Open" . For code 51/4, refer to "31.3.15 Check for Output Short to Ground" . For code 52/4, refer to "31.3.17 Check for Short, Code 52 4" .

1. To check code s 52/3, unplug the EGR solenoid.
2. Measure resistance between cavity 1 and ground. See Figure "EGR Solenoid Wiring" .



**Figure 2. EGR Solenoid Wiring**

- a. If resistance measurement is less than or equal to 5  $\Omega$ , Refer to "31.3.12 Check for Open Output" .
- b. If resistance measurement is greater than 5  $\Omega$ , the EGR solenoid ground wire is open. Repair and verify the repairs. Refer to "31.3.19 Verify Repair" .

### **Section 31.3.12 Check for Open Output**

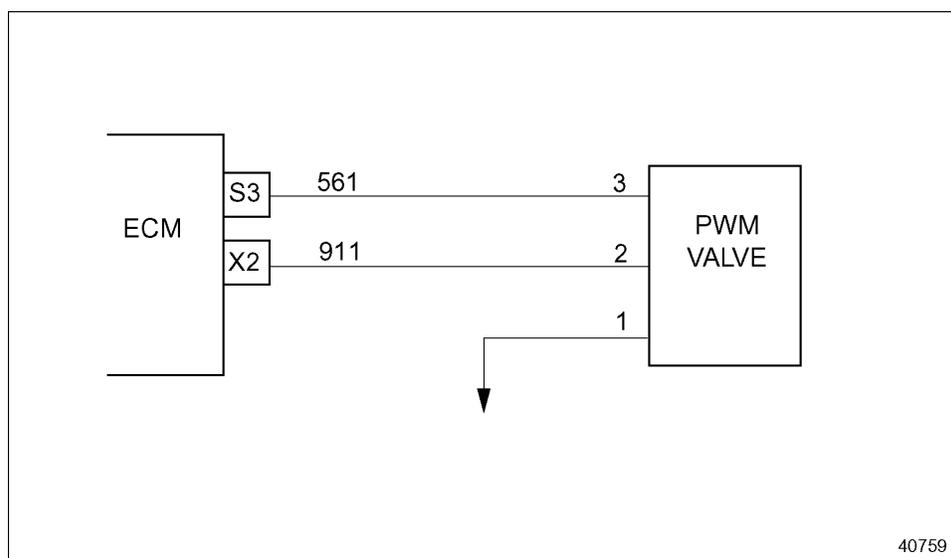
Perform the following steps to check for open:

1. Install a jumper between cavity 1 and 2. See Figure "EGR Solenoid Wiring" .
2. Disconnect engine sensor harness 30-pin connector.
3. Measure resistance between T3 and ground.
  - a. If resistance measurement is less than or equal to 5  $\Omega$ , replace the EGR solenoid.
  - b. If resistance measurement is greater than 5  $\Omega$ , wire #562 is open. Repair and verify. Refer to "31.3.19 Verify Repair"

### **Section 31.3.13 Check Ground for Open**

Perform the following steps to check the ground for open:

1. To check code s 51/3, unplug the PWM valve. See Figure "PWM Valve" .



**Figure 3. PWM Valve**

2. Measure resistance between cavity 1 and ground.
  - a. If resistance measurement is less than or equal to 5  $\Omega$ , refer to "31.3.14 Check for Open Output" .
  - b. If resistance measurement is greater than 5  $\Omega$ , the ground is open. Repair and verify the repair. Refer to "31.3.19 Verify Repair" .

### **Section 31.3.14 Check for Open Output**

Perform the following steps to check for open:

1. Install a jumper wire between cavity #2 and cavity #3. See Figure "PWM Valve" .
2. Disconnect the engine sensor harness 30-pin connector.
3. Measure resistance between cavity S3 and X2.
  - a. If resistance measurement is less than or equal to 5  $\Omega$ , replace the PWM valve.
  - b. If resistance measurement is greater than 5  $\Omega$ , line #561 is open. Repair and verify the repair. Refer to "31.3.19 Verify Repair" .

### **Section 31.3.15 Check for Output Short to Ground**

Perform the following steps to check for short:

1. Unplug the PWM valve. See Figure "PWM Valve" .
2. Measure resistance between cavity #2 and #3.
  - a. If resistance measurement is less than or equal to 5  $\Omega$ , wire #561 is shorted to ground. Repair and verify. Refer to "31.3.19 Verify Repair" .
  - b. If resistance measurement is greater than 5  $\Omega$ , Refer to "31.3.16 Check PWM Valve" .

### **Section 31.3.16 Check PWM Valve**

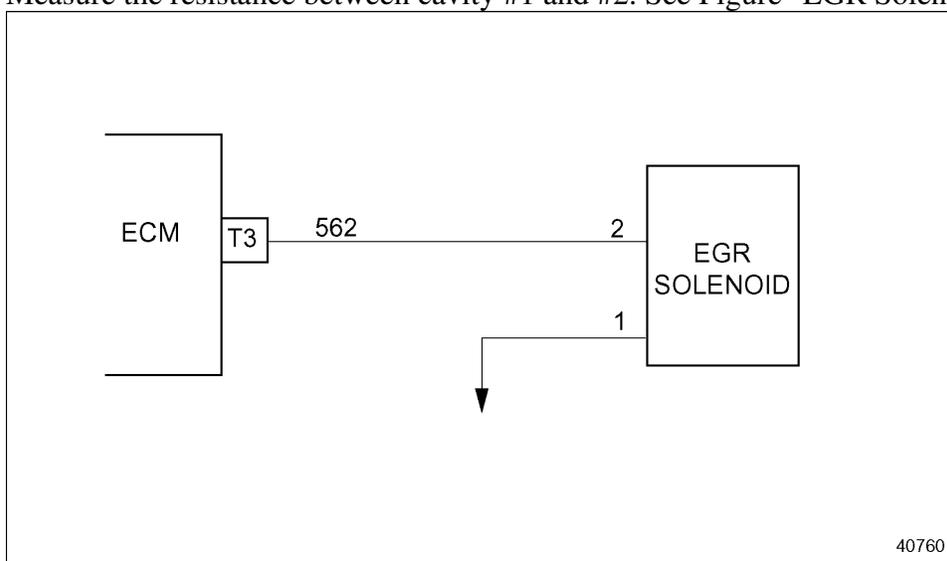
Perform the following steps to check the PWM valve:

1. Measure resistance between cavity #3 and the engine block. See Figure "PWM Valve" .
  - a. If resistance measurement is less than or equal to 5  $\Omega$ , wire #561 is grounded. Repair the short and verify. Refer to "31.3.19 Verify Repair" .
  - b. If resistance measurement is greater than 5  $\Omega$ , replace the PWM valve. Refer to "31.3.19 Verify Repair" .

### Section 31.3.17 Check for Short, Code 52 4

Perform the following steps to check for a short:

1. Unplug the EGR solenoid.
2. Measure the resistance between cavity #1 and #2. See Figure "EGR Solenoid Wiring " .



*Figure 4. EGR Solenoid Wiring*

- a. If the measured resistance is less than 5  $\Omega$ , wire #562 is shorted to ground.
- b. If the measured resistance is greater than 5  $\Omega$ , refer to "31.3.18 Check for Short" .

### Section 31.3.18 Check for Short

Perform the following steps to check for a short:

1. Measure the resistance between cavity #2 and the block.
  - a. If the measured resistance is less than 5  $\Omega$ , wire #562 is shorted. Repair and verify. Refer to "31.3.19 Verify Repair" .
  - b. If the measured resistance is greater than 5  $\Omega$ , replace the solenoid and verify the repair. Refer to "31.3.19 Verify Repair" .

### Section 31.3.19 Verify Repair

Perform the following steps to verify the repair.

1. Connect all connectors. Start and run the engine.
2. Test drive.
  - a. Did the fault return? Review the section to find the error. Perform all procedures for troubleshooting the EGR system. Refer to "31.3.11 Check for Open Ground" .
  - b. If the fault did not return, troubleshooting is complete.