

Section 10.4

Tests

The following tests support the recommended troubleshooting flow for specific operational concerns.

Section 10.4.1

TEST A

Perform Test A as follows. Refer to "11.1 Exhaust Gas Recirculation Valve Diagnostics" .

Section 10.4.2

TEST B

Test B steps are as follows and should be performed in order as written.

Perform test as follows.



WARNING:

PERSONAL INJURY

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

- Always start and operate an engine in a well ventilated area.
- If operating an engine in an enclosed area, vent the exhaust to the outside.
- Do not modify or tamper with the exhaust system or emission control system.

1. Run the engine on a dynamometer to get the engine hot. If a dynamometer is not available, run the engine until hot ($> 170^{\circ}\text{F}$ (76°C) coolant temperature).
2. Activate the VPOD outputs to 50% duty cycle using the DDDL. Visually inspect the VNT for proper rod travel.
 1. If the VNT is not functioning properly, please visit the Detroit Diesel Technical Service Letter Web Page at http://192.135.85.10/cust/sletr/revise_2004.asp and browse for Technical Service Letter 04 TS 16 or Detroit Diesel Special Publications Web Page at <http://192.135.85.10/public/sp/spnav.asp> and browse for Special Publication Number 18SP604.
 2. If the VNT is functioning properly, no further troubleshooting is required.

Note: Repeat this step three times.

3. Verify repairs.

Section 10.4.3

TEST C

Test C has eight basic tests and are as follows.

- Delta P Sensor
- VPOD Output Pressure
- Barometric Sensor (Test D)
- VPOD Input Pressure
- VPOD Part Number and Supply Voltage
- VPOD Wiring
- Active Codes
- Final Test

The following tools are required to perform the six basic tests.

- Low wattage 1,000 Ω resistor
- DDDL version 4.2 or higher or DDR suite 8
- Volt Ohm Meter (VOM)
- Pressure gage 1379 kPa (0-200 psi)
- Pressure gage 690 kPa (0-100 psi)

Section 10.4.3.1

Delta P Sensor Test

Check the Delta P Sensor as follows:

1. Turn ignition ON (key ON, engine OFF).
2. Connect either Detroit Diesel Diagnostic Link® (DDDL) or a Diagnostic Data Reader (DDR).
3. Read the Delta P counts and record the data.
4. Remove the Delta P Sensor from the mounting plate.

**WARNING:****EYE INJURY**

To avoid injury from flying debris when using compressed air, wear adequate eye protection (face shield or safety goggles) and do not exceed 276 kPa (40 psi) air pressure.

5. Blow down through the sensor tubes (by way of the holes in the mounting plate).
6. Gently shake the sensor to remove any moisture before reinstalling. Moisture in the sensor does not cause permanent damage.
7. Turn ignition ON (key ON, engine OFF).
8. Connect either DDDL or a DDR.
9. Read the Delta P counts and record the data.
 1. If the recorded Delta P counts read 86-118 (from step 9), verify that the Venturi Tube hoses-to-Delta P Sensor are correctly installed and are not damaged. See Figure . Repair as necessary; verify repairs. Visually inspect the delivery pipe for damage and proper assembly. If no problem was found, perform a VPOD Output Pressure Test "10.4.3.2 VPOD Output Pressure Test" found in the next section.

Note: Damaged hoses will have an adverse effect on engine performance resulting in black exhaust smoke and engine surging.

2. If the Delta P counts are out of the 86-118 range, perform Delta P sensor auto calibration using DDDL. Retest; if Delta P sensor counts are not between 86 and 118, replace the Delta P sensor, then refer to "20.18.1 Check EGR Controls" . If the counts are between 86 -118 then verify repair.

Section 10.4.3.2**VPOD Output Pressure Test**

Test steps are as follows:

1. Disconnect the air hose from the VNT actuator.
2. Install gage at the outlet of the VNT air line. See Figure "Gage Setup" .

Note: The gauge should be accurate to within 1.4 kPa (0.2 psi).

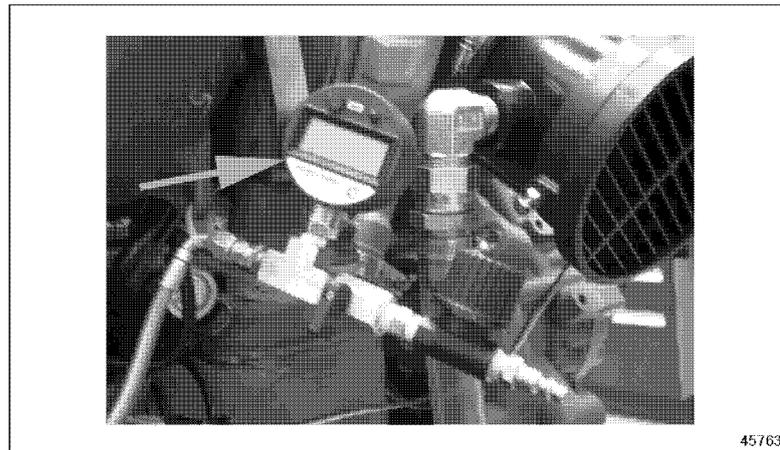


Figure 1. Gage Setup

3. Using either DDDL or DDR, activate the PWM #4 duty cycles and monitor the output pressure from the VPOD. Activate the duty cycle to 90%. Pressure should equal 483-517 kPa (70-75 psi @ VPOD).

Note: Both activations must have full linkage travel.

NOTICE:

Ensure that the VPOD air supply line fitting is not crossed-threaded when connecting the VPOD air supply to the turbo actuator. If the air supply line fitting is not properly seated, the turbo actuator will not function properly.

4. Connect VPOD air supply line to the turbo actuator. Perform a VPOD Input Pressure Test "10.4.3.3 VPOD Input Pressure Test" .

Section 10.4.3.3**VPOD Input Pressure Test**

Perform the following steps to test the VPOD input pressure.

1. Measure the VPOD input pressure to Port 1.
 1. If the supply pressure is not between 703-1296 kPa (90-120 psi), troubleshoot the vehicle air system until that result is obtained. Repair as necessary.

2. If the supply pressure is between 703-1296 kPa (90-120 psi), perform a VPOD Part Number and Supply Voltage Test "10.4.3.4 VPOD Part Number and Supply Voltage Test and Part Number Check" .
2. Verify repairs.

Section 10.4.3.4

VPOD Part Number and Supply Voltage Test and Part Number Check

Perform the follow steps to verify the VPOD part number and supply voltage.

1. Check VPOD label to determine if it is + 12 V or + 24 V system.

Note: A 1,000 Ω resistor or a volt Ohm meter is required to perform step 2 .

2. Unplug the VPOD wire connectors and insert the 1,000 Ω resistor between cavities 1 and 3.
 1. Turn ignition switch ON.
 2. Measure voltage from pin 3 to pin 1.
 3. Plug in DDDL or DDR to measure the ECU voltage.
3. Is the VPOD part number and voltage and the ECU voltage correct?
 1. If the VPOD part number and voltage and the ECU voltage are correct, perform a VPOD Wiring Test "10.4.3.5 VPOD Wiring Test" .
 2. If the VPOD part number and voltage and the ECU voltage were not correct, match the VPOD component to the ECU voltage and perform a VPOD Wiring Test "10.4.3.5 VPOD Wiring Test" .

Section 10.4.3.5

VPOD Wiring Test

Perform the following steps to test the VPOD wiring.

Note: VPOD power should have been verified during the VPOD and Supply Voltage Test and Part Number Check. If not, perform a VPOD Part Number and Supply Voltage Test.

1. Turn ignition switch ON.
2. Disconnect the VPOD sensor connectors.
3. Insert a 1,000 Ω resistor between cavities Number 2 and Number 1 for a 12 V version, or cavities Number 2 and Number 3 for a 24 V version.
4. Connect a VOM to the VPOD connector between pin Number 2 and pin Number 3 for a 12 V VPOD or pin Number 2 and pin Number 1 for a 24 V VPOD.
5. Using either a DDDL or DDR, activate the PWM #4 (VNT) and ensure that activating 50 % duty cycle: $VDC = 50\%$ of the VPOD supply voltage ± 1 volt. (e.g. voltage to VPOD = 13.8 V * 0.5 = 6.8 V, therefore 5.8 V to 7.8 V at VPOD is okay).
6. Listen for air leaks from the VPOD when PWM are activated to 50%.
 1. If the PWM voltage measurement is correct, go to step 7 .
 2. If the PWM voltage measurement is incorrect and the wiring checks were correct, try a test ECU programmed for EGR or contact the Detroit Diesel Customer Support Center (800-445-1980).
7. Verify repairs. Perform an Active Codes Test "10.4.3.6 Active Codes Test" .

Section 10.4.3.6

Active Codes Test

Perform the following steps to test for active codes.

1. Turn ignition ON.
2. Connect either a DDDL or a DDR reader.
3. Read active codes.
4. Record or print codes. Ensure that PID, SID, and FMI are recorded. Refer to the proper code section of the DDEC V Single ECU Troubleshooting Guide , (6SE565) to troubleshoot that code.

Note: FMIs listed as 14 are diagnostic information codes and no troubleshooting is required. For example, an engine derates due to high TCO temperature; a 404/14 code will be stored. This would indicate that conditions warranted having the ECU derate the fueling to the engine. If the customer complaint was a power loss, it could be explained that loss of power was done by the ECU to protect other engine components.

5. If the issue is not related to the EGR system components, or if technical support is required, contact the Detroit Diesel Customer Support Center (800-445-1980).
6. Perform a Final Test "10.4.3.7 Final Test" .

Section 10.4.3.7

Final Test

Follow these steps for a final test:

1. Reconnect all disconnected sensors and wiring harnesses and assemble all disassembled components.
2. Start and run the engine.
3. Perform a road test to try and duplicate the original complaint.
 1. If original symptoms and codes are not detected, repairs are complete.
 2. If any original codes are detected, review this section again and contact the Detroit Diesel Customer Support Center (800-445-1980).

Section 10.4.4 TEST D

Test D steps are as follows.

Note: Engines built from February 2004 (Serial Number: 06R0761470) through the end of July 2004 (Serial Number: 06R0788688) may be affected.

1. Turn the ignition ON but leave the engine OFF.
2. Connect either Detroit Diesel Diagnostic Link® (DDDL) or a Diagnostic Data Reader (DDR) to measure the barometric pressure and compare the results of the measured values to the barometric pressure in your area.
 1. If the difference is greater than 4.1 kPa (0.6 psi), replace the Barometric Pressure Sensor.
 2. If the difference is less than or equal to 4.1 kPa (0.6 psi), go to step 3.
3. Compare the barometric pressure to the Inlet Manifold Pressure Sensor.
 1. If pressure difference is greater than 4.1Kpa (0.6 psi), replace the Inlet Manifold Pressure Sensor.
 2. If the pressure is less than 4.1 kPa (0.6 psi), testing is complete. Verify repair.
4. Verify repair.
 1. If Flash Code 39 (SID 147/FMI 2) is not logged, repair is complete.
 2. If Flash Code 39 (SID 147/FMI 2) is logged, contact the Detroit Diesel Customer Support Center (800-445-1980).

Section 10.4.5 TEST E

Test E steps are as follows.

1. Verify ECU program software version.
 1. If the ECU software version is not Level 2.0, perform step 2 and 3.
 2. If the ECU software is Level 2.0 or higher, "10.4.5 TEST E" is complete.
2. Download the mainframe file for particular engine serial number (no mainframe changes required).
3. Program the ECU.

Section 10.4.6 TEST F

Engines equipped with a tube and shell bolted flanged cooler that have a coolant-lost complaint need to be inspected for leaks from other sources. The spring wire hose clamps are a possible coolant leak path, and should be inspected. If the spring wire clamps are damaged, service kits are available to replace the damaged components.

A standard test to pressurize the coolant system and investigation of overall coolant system should have been performed prior to inspecting the cooler. There may be other components of the engine that are responsible for the loss of engine coolant.

Note: Coolers with internal leaks usually show signs of a white coolant drop-out at the exhaust side of the cooler, the Delta P Sensor lines, or at the delivery pipe to intake manifold connector.

If the entire system has been tested, perform the following steps to inspect the cooler:

1. Use hoses, clamps, plugs, and a regulator to seal the cooler water inlet and water outlet ports. See Figure "EGR Cooler Ports Setup".

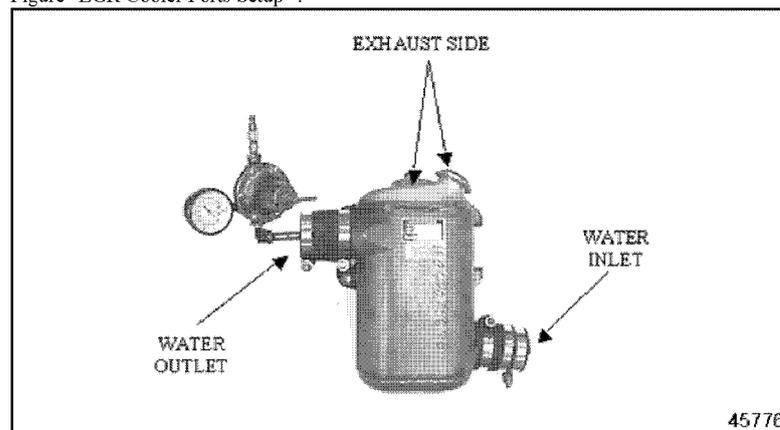


Figure 2. EGR Cooler Ports Setup

2. Fill the exhaust side of the cooler with hot tap water. Allow the water to overflow until the loose carbon has floated away allowing for a clear viewing of any bubbles. See Figure "Filling the EGR Cooler with Tap Water".

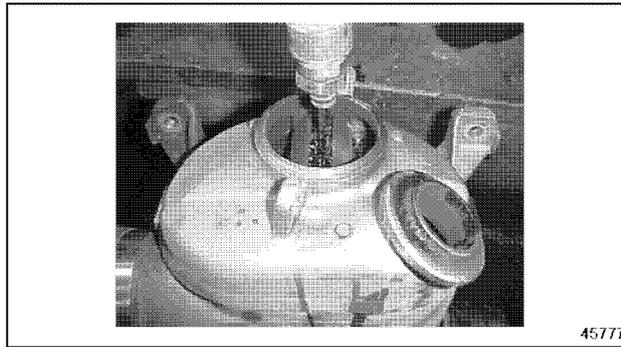


Figure 3. Filling the EGR Cooler with Tap Water

3. Apply 207 kPa (30 psi) of regulated air to the regulator for three minutes. See Figure "EGR Cooler Ports Setup"
4. Disconnect the regulated air supply from the regulator and watch for bubbles on the exhaust side of the cooler. See Figure "Observing the EGR Cooler for Bubbles" .
 1. If bubbles were observed, replace the cooler.
 2. If no bubbles were observed, contact the Detroit Diesel Customer Support Center for further information (880-445-1980).

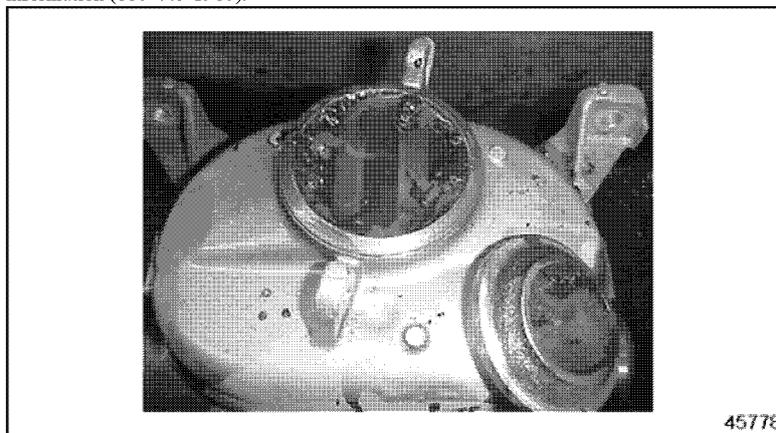


Figure 4. Observing the EGR Cooler for Bubbles

Section 10.4.7
TEST G

The air supply line which connects to the VPOD must be a dedicated air supply line. To ensure that the air supply line is a dedicated air supply line, please read Freightliner Service Information Bulletin 01-81 (see Figure "Freightliner Service Bulletin 01-81 (Page One of Three)", see Figure "Freightliner Service Bulletin 01-81 (Page Two of Three)", and see Figure "Freightliner Service Bulletin 01-81 (Page Three of Three)").

Incorrect Detroit Diesel VPOD Plumbing

01-81

FLA CDE
FLB CDE
FLD Conventional
Business Class

FLC 112 Conventional
Century Class Conventional
Argosy CDE
Cargo

Columbia
Coneor
Coronado
Business Class M2

Freightliner
Service Bulletin

General Information

The air supply line for the Variable Pressure Output Device (VPOD) on Detroit Diesel Series 60 engines was incorrectly plumbed at the plant. The 1/2-inch diameter supply line to the VPOD must be a dedicated air line. The current plumbing configuration has the supply line connected to a pressure protection valve along with the junction block supply line on the secondary air tank. This can result in engine misfires and "stumbling" of the engine.

To correct this situation, remove the air line from the existing pressure protection valve and connect it by itself to a new pressure protection valve in an unused port on the secondary air tank. Follow the instructions below.

Parts Required

Parts are available from the PDCs. See Table 1.

Part Number	Description	Qty.
PH VS211P 6	Plug, 3/8-inch NPT	1
GTD 223 455V	Pressure Protection Valve	1

Table 1, Parts Required

Procedure

1. Park the vehicle on a level surface, apply the parking brakes, shut down the engine, and chock the tires.
2. Drain the air system.
3. Find the yellow, 1/2-inch diameter VPOD air line on the secondary air tank, on the left side of the vehicle. It should be connected to a pressure protection valve along with the junction block supply line. See Fig. 1.

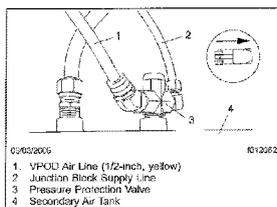


Fig. 1, Existing Location of the VPOD Air Line (typical)

4. Trace the VPOD air line back to the right side of the engine to verify that it connects to the VPOD. See Fig. 2.
5. Find an unused port on the secondary air tank.

Figure 5. Freightliner Service Bulletin 01-81 (Page One of Three)

01-81

Incorrect Detroit Diesel VPOD Plumbing

Freightliner
Service Bulletin

FLA CDE
FLB CDE
FLD Conventional
Business Class

FLC 112 Conventional
Century Class Conventional
Argosy CDE
Cargo

Columbia
Coneor
Coronado
Business Class M2

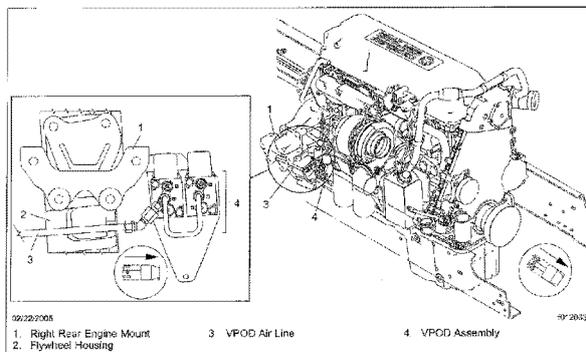


Fig. 2, VPOD and Air Line on the Engine

IMPORTANT: If there is not an unused port available on the secondary air tank, contact your District Service Manager. Do not proceed with these instructions without doing so.

6. If there is an unused port on the secondary air tank, disconnect the yellow VPOD supply line from the quick-disconnect fitting on the pressure protection valve.
7. Remove and save the quick-disconnect fitting.
8. Apply Teflon® tape to the threads of the new 3/8-inch plug and install it in the existing pressure protection valve where the quick-disconnect fitting and the VPOD line were.
9. Find an unused port on the secondary air tank and remove the 3/8-inch NPT plug from it. Save the plug.
10. Apply Teflon tape to the threads of the new pressure protection valve, then install it in the unused port of the secondary air tank.
11. Install the previously removed quick-disconnect fitting in one of the ports of the new pressure protection valve.
12. Apply Teflon tape to the threads of the 3/8-inch NPT plug previously removed from the port in the secondary air tank, then install it in the other port of the new pressure protection valve.
13. Loosen a suitable length of the VPOD air supply line and connect it to the new pressure protection valve. See Fig. 3.

If necessary, secure the air line with tie straps.

Figure 6. Freightliner Service Bulletin 01-81 (Page Two of Three)

Incorrect Detroit Diesel VPOD Plumbing

01-81

Freightliner Service Bulletin

FLA COE
FLB COE
> FLB Conventional
Business Class

FLC 112 Conventional
> Century Class Conventional
> Argus COE
Cargo

> Columbia
Comdor
> Coronado
Business Class M2

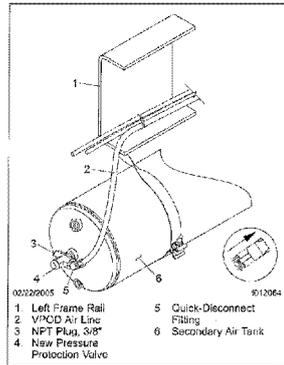


Fig. 3, New Location for VPOD Air Line

14. Start the engine, build the air system pressure to the operating level, and check the connections for leaks. If leaks are detected, shut down the engine, drain the air tanks, and tighten any connections and fittings as needed.
If no leaks are detected, shut down the engine.
15. Remove the chocks from the tires.

Warranty

Normal warranty applies. Use the damage code and time guide information in Table 2. Refer to this bulletin by number in the story of the claim and enter GTD 223 455 as the failed part number.

Damage Code and Time Guide Information			
Damage Code	Operation Number	Description	Time: hours
10T-900324940	10T-90358A	VPOD Supply Line Rerouting	0.4

Table 2, Damage Code and Time Guide Information

Figure 7. Freightliner Service Bulletin 01-81 (Page Three of Three)

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