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Service Information Bulletin

SUBJECT	DATE
Low Power or Rough Running	May 2019

Additions, Revisions, or Updates

Publication Number / Title	Platform	Section Title	Change
DDC-SVC-MAN-0010	EPA07 MBE4000	Low Power or Rough Running	Rename section to "Low Power or Rough Running". Remove the current sections 14.8 and 14.10. Update information in this section. Delete all of Section 13.



13400 Outer Drive, West, Detroit, Michigan 48239-4001
 Telephone: 313-592-5000
www.demanddetroit.com

13.1 LOW POWER/ROUGH RUNNING

Check as follows:

1. Are there any active fault codes or starting difficulties?
 - [a] Yes; perform the troubleshooting for the active code or starting difficulty first; refer to section 5
 - [b] No; go to step 2.
2. Was the oil filter recently removed?
 - [a] Yes; remove oil filter and inspect the bypass valve. Go to step 3.
 - [b] No; go to step 4.
3. Is the bypass valve damaged or unseated?
 - [a] Yes; repair as necessary.
 - [b] No; go to step 4.
4. Start the engine and observe the fuel pressure using a mechanical gauge. Compare fuel pressures to the chart below:

Estimated Fuel Pressures	
RPM	EPA 07 MBE 4000
600	448 to 482 kPa (65 to 70 psi)
1800	620 to 655 kPa (90 to 95 psi)

5. Are the fuel pressures within range as per the chart?
 - [a] Yes; go to step 10.
 - [b] No; go to step 6.
6. Bypass the chassis fuel system. Are fuel pressures within range?
 - [a] Yes; inspect OEM fuel system for potential restrictions or leaks.
 - [b] No; go to step 7.
7. Replace the fuel filters (only use correct MBE brand fuel filters). Are fuel pressures within range?
 - [a] Yes; verify repairs.
 - [b] No; go to step 8.
8. Replace the overflow valve. Refer to section 4.3 of the EPA07 MBE 4000 workshop manual. Are fuel pressures within range?
 - [a] Yes; verify repairs.

- [b] No; go to step 9.
- 9. Check for aerated fuel. Refer to section 13.2. Is fuel aerated?
 - [a] Yes; refer to aerated fuel resolution. Refer to section 13.2.1
 - [b] No; replace low pressure fuel pump.
- 10. Using Diagnostic Link®, perform a Relative Compression test. The test measures relative compression of each cylinder with the “best” one shown as 100% and the others displayed as a percentage of the best cylinder. Look for cylinders that are more than 10% lower than the highest cylinder. This will be the suspected bad cylinder. Does the relative compression test pass?
 - [a] Yes; go to step 12.
 - [b] No; perform mechanical compression test (refer to section 2.2) and go to step 11.
- 11. Does the mechanical compression test pass?
 - [a] Yes; go to step 12.
 - [b] No; find the cause of the low compression and repair as necessary
- 12. Using Diagnostic Link perform an Idle Speed Balance (ISB) test. Does any cylinder fail the ISB test?
 - [a] Yes; inspect high pressure fuel system on the cylinder that failed the test and repair as necessary
 - [b] No; go to step 13.
- 13. Remove the air filter element from the air cleaner container; refer to OEM guidelines. Is the air filter damaged or clogged?
 - [a] Yes; replace air filter element. Verify repairs.
 - [b] No; go to step 14.
- 14. Check for restricted or cracked CAC; refer to section 13.7. Was damage found?
 - [a] Yes; repair as necessary; refer to section 13.7.
 - [b] No; go to step 15.
- 15. Check for leaking intake manifold gasket; refer to section 13.8. Was damage found?
 - [a] Yes; repair as necessary. Refer to section 13.8.
 - [b] No; go to step 16.
- 16. Unplug the fuel temp sensor and test drive the unit. Does the unit still have low power?
 - [a] Yes; go to step 17
 - [b] No; replace the fuel temp sensor and verify repairs.
- 17. Unplug the inlet air temperature sensor and test drive the unit. Does the unit still have low power?
 - [a] Yes; go to step 18.

- [b] No; replace the inlet air temperature sensor and verify repairs
- 18. Verify proper turbo operation and inspect for damage. Refer to letter 18SP670 for turbo waste gate operation. Is the turbo operating correctly?
 - [a] No; repair as necessary
 - [b] Yes; replace fuel nozzles.

13.2 AERATED FUEL

To determine if aerated fuel is causing lack of power, perform the following steps:

1. Test for aerated fuel.
2. Disconnect the fuel line return hose from the fitting located at the fuel tank; refer to OEM guidelines.
3. Place the open end of the fuel line into a suitable container.

 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.

 WARNING: PERSONAL INJURY
To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

 WARNING: PERSONAL INJURY
To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

4. Start and run the engine.
5. Operate the engine at 1000 rpm.
6. Visually check to see if air bubbles are rising to the surface of the fuel that collects within the container.
 - [a] If air bubbles are not present, shut down the engine, return, and continue with the initial diagnostics that directed you to Aerated Fuel.

- [b] If air bubbles are present, shut down the engine; refer to section 13.2.1.

13.2.1 Aerated Fuel Resolution

Perform the following steps to resolve aerated fuel condition:

1. Tighten all fuel line connections between fuel tank and fuel pump; refer to OEM guidelines.
2. Visually inspect all fuel lines between fuel tank and fuel pump for leaks.
3. Repair damaged components as required; refer to OEM guidelines.
4. Verify aerated fuel resolution; refer to section 13.2.1.1.

13.2.1.1 Test the Engine with Aerated Fuel Resolution

Perform the following steps to determine if aerated fuel resolution has resolved lack of power condition:

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 WARNING: PERSONAL INJURY
To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

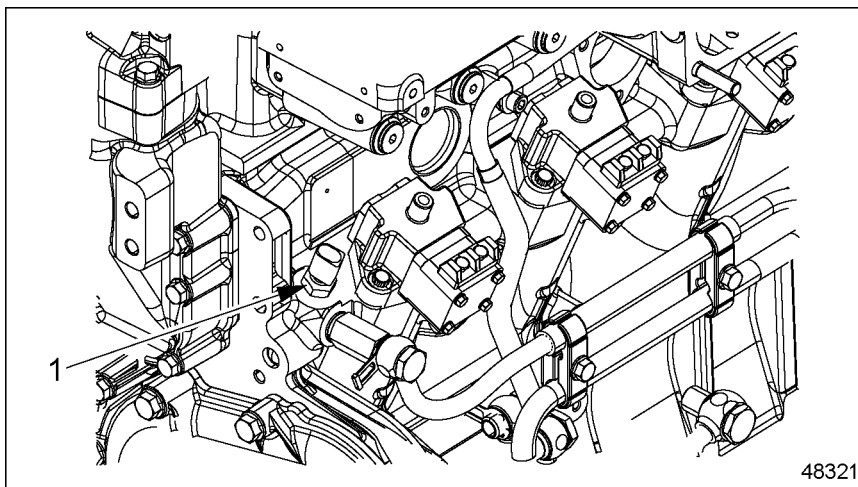
 WARNING: PERSONAL INJURY
To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

1. Start and run the engine.
2. Run the engine at idle with a no-load condition for approximately five minutes, allowing the engine coolant to reach normal operating range.
3. Test drive the vehicle to ensure lack of power has been resolved.
 - [a] If no lack of power occurred during the test drive, no further troubleshooting is required. Shut down the engine.
 - [b] No; shut down the engine, return, and continue with the initial diagnostics that directed you to Aerated Fuel.

13.3 HIGH FUEL PRESSURE

To determine if high fuel pressure is causing a lack of power, perform the following steps:

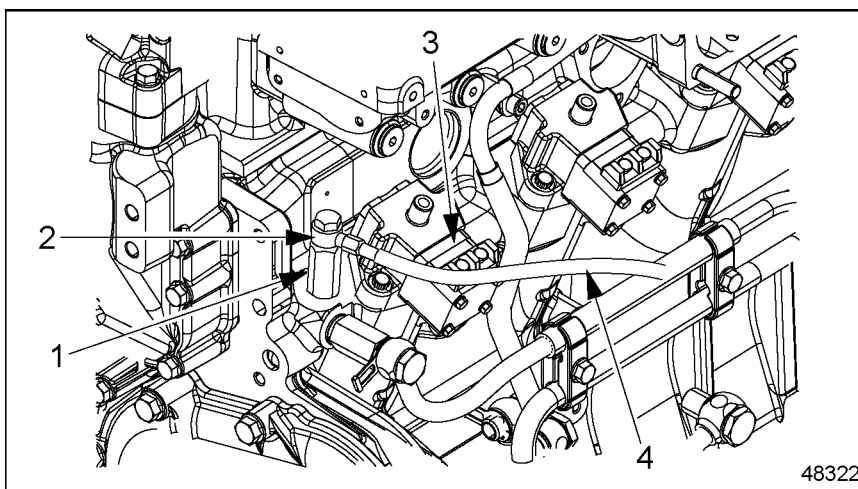
1. Disconnect the electrical connector from the fuel temperature sensor.
2. Remove the fuel temperature sensor and washer. See Figure 13-1.



1. Fuel Temperature Sensor

Figure 13-1 **Disconnecting the Sensor**

3. Install the adaptor and banjo fitting, part of kit (J-46377), and high pressure line. See Figure 13-2.



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| 1. Adaptor form Kit J-46377 | 2. Banjo Fitting |
| 3. Electronic Unit Pump | 4. High Pressure Line J-46372 |

Figure 13-2 **Connecting the Adaptor**

4. Attach a calibrated gauge (J-46378) capable of reading 0-100 psi, to the high-pressure fuel line (J-46372), leading to the tee-fitting. See Figure 13-2.

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 WARNING: PERSONAL INJURY
To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

 WARNING: PERSONAL INJURY
To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

5. Start and run the engine to the speeds Refer to section 11.8.2 and record the fuel pressure.

Engine Speed, rpm	Fuel Pressure, kPa (psi)
600-650	430 (62)
2500	400-650 (58-94)

Table 13-1 Fuel Pressure at Various Speeds

6. Shut down the engine.
7. Remove the adaptor, banjo fitting, high pressure line, and high pressure gauge.
8. Reinstall the fuel temperature sensor and new washer. Torque the sensor to 30 N·m (22 lb·ft).

9. Connect the electrical connector to the fuel temperature sensor.
10. Analyze the measure fuel pressure readings.
 - [a] If the fuel pressure is within specifications listed in Table 13-1, check for high fuel temperature return; refer to section 13.5.
 - [b] If the fuel pressure is greater than specifications listed in Table 13-1, Refer to section 13.4.1.

13.4 FAULTY OVERFLOW VALVE

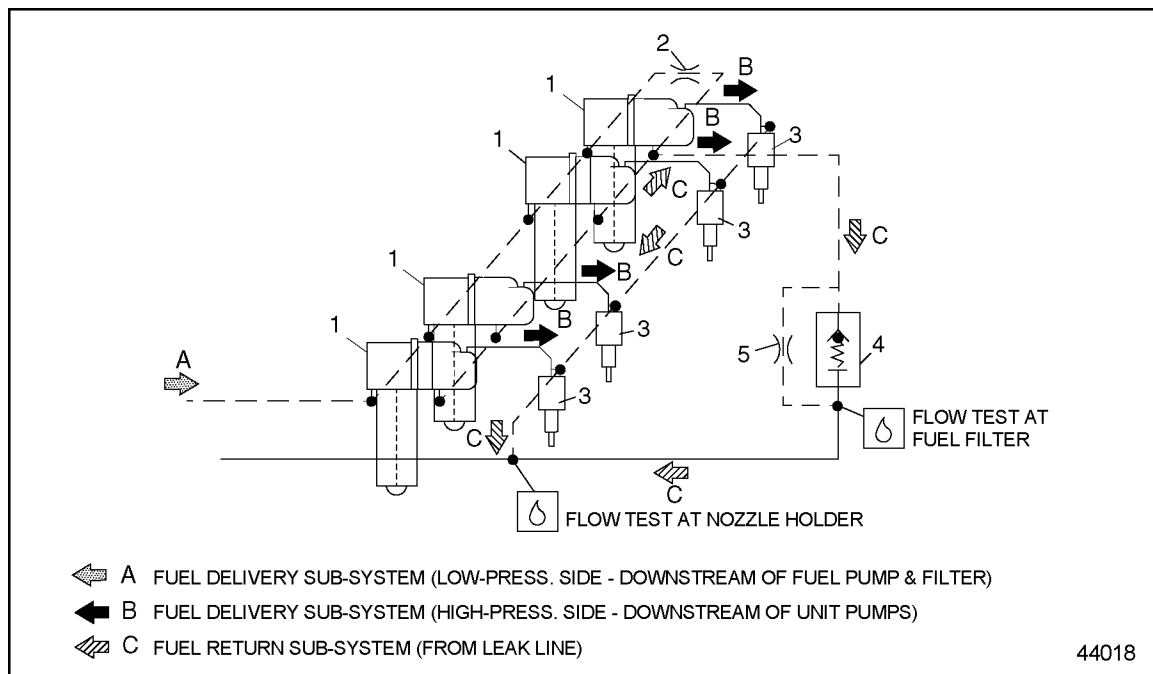
To determine if a faulty overflow valve is causing a lack of power, perform the following steps:

1. Run Fuel system Test #1: Downstream Pressure Test. Refer to section 4.3.
2. If Test #1 indicates faulty overflow valve, proceed to step 3.
3. Run fuel system Test #3: Flow Test – At Fuel Filter. Refer to section 4.5.
4. If the overflow valve is found to be faulty, replace the overflow valve. Refer to section 13.4.1.

13.4.1 Overflow Valve Replacement

Perform the following steps to replace the overflow valve.

1. Remove the overflow valve from the fuel return line.
2. Install a new overflow valve. Tighten the valve to 48-52 N·m (35-38 lb·ft). See Figure 13-3.



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| 1. Unit Pump | 4. Overflow Valve |
| 2. Bypass to Fuel Return Port | 5. Constant Ventilation (overflow) |
| 3. Fuel Injector | |

Figure 13-3 Overflow Valve Location

3. Verify overflow valve replacement; refer to section 13.4.1.1.

13.4.1.1 Test the Engine with Replaced Overflow Valve

Perform the following steps to determine if the replaced overflow valve has resolved lack of power condition:

 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.

 WARNING: PERSONAL INJURY
To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

 WARNING: PERSONAL INJURY
To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

1. Start and run the engine.
2. Run the engine at idle with a no-load condition for approximately five minutes, allowing the engine coolant to reach normal operating range.
3. Test drive the vehicle to ensure lack of power has been resolved.
 - [a] If no lack of power occurred during the test drive, no further troubleshooting is required. Shut down the engine.
 - [b] No; shut down the engine, return, and continue with the initial diagnostics that directed you to Fault Overflow Valve.

13.5 HIGH FUEL TEMPERATURE RETURN

To determine if high fuel temperature return is causing lack of power, perform the following steps:

1. Test for high fuel temperature return.
2. Analyze the high fuel temperature test results.
 - [a] If the return fuel temperature is less than or equal to 60°C (140°F), return, and continue with the initial diagnostics that directed you to High Fuel Temperature Return.
 - [b] If the return fuel temperature is greater than 60°C (140°F), resolve the high fuel temperature return condition; refer to section 13.5.1.

13.5.1 High Fuel Temperature Resolution

Perform the following steps to resolve high fuel temperature return:

1. Remove and replace fuel filter(s), refer to MBE 4000 Workshop Manual.
2. Verify high fuel temperature repair; refer to section 13.5.1.1.

13.5.1.1 Test the Engine with Resolved High Fuel Temperature

Perform the following steps to determine if high fuel temperature repairs have resolved lack of power condition:

**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.

**WARNING:****PERSONAL INJURY**

To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

**WARNING:****PERSONAL INJURY**

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

1. Start and run the engine.
2. Test drive the vehicle to ensure lack of power has been resolved.
 - [a] If lack of power did not occur during the test drive, no further troubleshooting is required. Shut down the engine.
 - [b] No; shut down the engine, return, and continue with the initial diagnostics that directed you to High Fuel Temperature Return.

13.6 RESTRICTED AIR CLEANER ELEMENT

To determine if a restricted air cleaner element is causing lack of power, perform the following steps:

1. Remove the air filter element from the air cleaner container; refer to OEM guidelines.
2. Visually inspect the air cleaner element for damage or clogging.
 - [a] If no damage or clogging is found, check the charge air cooler; return, and continue with the initial diagnostics that directed you to Restricted Air Cleaner Element.
 - [b] If damage or clogging is found, refer to section 13.6.1.

13.6.1 Air Filter Element Replacement

Perform the following steps to replace the air filter element:

1. Remove and replace the damaged or clogged air filter element; refer to OEM guidelines.
2. Verify air filter element replacement; refer to section 13.6.1.1.

13.6.1.1 Test the Engine with Replaced Air Filter Element

Perform the following steps to determine if the new air filter element has resolved lack of power:

**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.

**WARNING:****PERSONAL INJURY**

To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

**WARNING:****PERSONAL INJURY**

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

1. Start and run the engine.
2. Test drive the vehicle to ensure lack of power has been resolved.
 - [a] If lack of power did not occur during the test drive, no further troubleshooting is required. Shut down the engine.
 - [b] No; shut down the engine, return, and continue with the initial diagnostics that directed you to Restricted Air Cleaner Element.

13.7 RESTRICTED OR CRACKED CHARGE AIR COOLER

To determine if a restricted or cracked charge air cooler is causing lack of power, perform the following steps:

NOTICE:

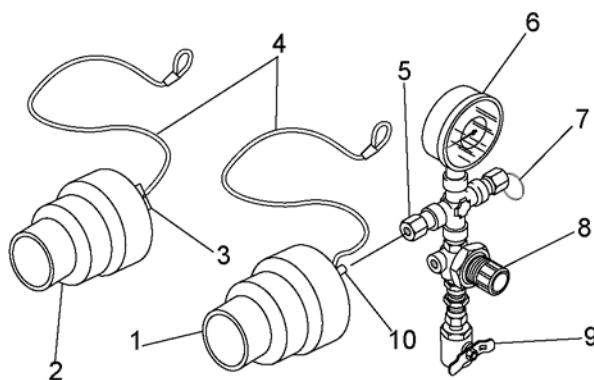
To avoid engine damage, follow the installation instructions provided with the air-to-air charge air cooler test kit.

1. Visually inspect the core, tanks, and welds for cracks and holes. If cooler fails visual inspection replace the charge air cooler; refer to section 13.7.2.
2. Pressure test the charge air cooler; refer to section 13.7.1.
3. Evaluate the results from pressure testing the charge air cooler.
 - [a] If the pressure drop is 34 kPa (5 psi) or less in 15 seconds, the cooler is good. Return and continue with the initial diagnostics that directed you to Restricted or Cracked Charge Air Cooler.
 - [b] If the pressure drop is greater than 34 kPa (5 psi) in 15 seconds, replace the charge air cooler; refer to section 13.7.2.

13.7.1 Pressure Testing the Charge Air Cooler

Perform the following to pressure test the charge air cooler:

1. Use the charge air cooler tester (J-41473) to test cooler for leaks. See Figure 13-4 for component parts.



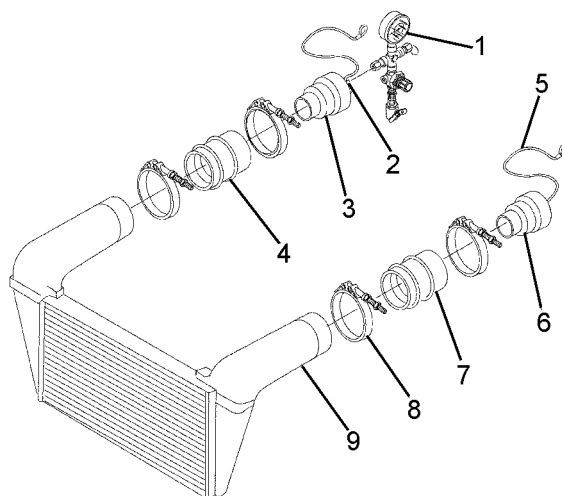
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| 1. Gauge Coupler | 6. Gauge |
| 2. Bleed-off Coupler | 7. Pressure Relief Valve |
| 3. Bleed Valve | 8. Air Regulator Valve |
| 4. Safety Straps | 9. Air Shutoff Valve |
| 5. Quick Disconnect | 10. Quick Disconnect Fitting |

Figure 13-4 Charge Air Cooler Tester J-41473

2. Disconnect the air inlet and outlet piping connecting the charge air cooler to the engine.

3. Install the charge air cooler test gauge coupler into the inlet hose (hot side) of the charge air cooler coming from the turbocharger compressor. Secure hose and coupler with clamp removed and torque the clamp to 5.6-6.78 N·m (50-60 lb·in.). See Figure 13-5.



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| 1. Gauge/Regulator Assembly | 6. Bleed-off Coupler |
| 2. Quick Disconnect Fitting | 7. Charge Air Cooler Hose (Cold Side) |
| 3. Gauge Coupler | 8. Clamp |
| 4. Charge Air Cooler Hose (Hot Side) | 9. Charge Air Cooler |
| 5. Safety Strap | |

Figure 13-5 Charge Air Cooler and Tester J-41473

4. Attach the gauge/regulator assembly to the quick disconnect fitting on the gauge coupler.
5. Use the clamp removed to attach the bleed-off coupler to the outlet hose (cold side) of the charge air cooler. Torque the clamp to 5.6-6.78 N·m (50-60 lb·in.).
6. Connect the safety straps on the couplers to any convenient screw on the radiator mounting bracket.

⚠ WARNING:

PRESSURIZED AIR AND FLYING PARTICLES

To avoid injury to eye or face, wear a face shield or goggles when conducting a pressure test.

7. Attach an air pressure line, with filtered air, to the air shutoff valve and gradually pressurize the charge air cooler to a pressure of 205 kPa (30 psi). If necessary, perform the following steps to adjust the air regulator until the gauge reads 205 kPa (30 psi):

- [a] Pull regulator knob outward to unlock.
 - [b] Turn knob to adjust pressure to 205 kPa (30 psi).
 - [c] Push the regulator knob back into locked position.
8. Close the air shutoff valve and monitor the gauge with a stop watch for 15 seconds. Note any decrease in air pressure.
 9. Repeat test at least three times to verify results.
 - [a] In pressure drop is 34 kPa (5 psi) or less in 15 seconds the cooler is good.
 - [b] If the pressure drop is greater than 34 kPa (5 psi) in 15 seconds, replace the charge air cooler. Refer to section 13.7.2.
 10. Slowly release pressure with the charge air cooler by opening the valve in the bleed-off coupler.
 11. Remove all charge air cooler tester pieces and reconnect charge air cooler piping to the engine.
 12. Reconnect air inlet and outlet piping to engine. Torque hose clamps to 5.6 - 6.78 N·m (50 - 60 lb·in.).

13.7.2 Charge Air Cooler Replacement

Perform the following steps to replace the charge air cooler:

1. Remove and replace the charge air cooler; refer to OEM guidelines.
2. Verify replacement of the charge air cooler, return, and continue with the initial diagnostics that directed you to Restricted or Cracked Charge Air Cooler.

13.8 FAULTY AIR INTAKE MANIFOLD GASKET

Perform the following steps to troubleshoot a faulty air intake manifold gasket:

1. Remove the air intake manifold; refer to MBE 4000 Workshop Manual
2. Inspect the air intake manifold and gaskets.
3. Install the air intake manifold with new gaskets; refer to MBE 4000 Workshop Manual.
4. Verify repair of the intake manifold; refer to section 13.8.1.

13.8.1 Test the Engine with Replaced Charge Air Cooler or Air Intake Manifold Gasket

To determine if the repairs resolved the lack of power condition, perform the following steps:

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 WARNING: PERSONAL INJURY
To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

 WARNING: PERSONAL INJURY
To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

1. Start and run the engine.
2. Test drive the vehicle to ensure lack of power has been resolved.

- [a] If no lack of power occurred during the test drive, no further troubleshooting is required. Shut down the engine.
- [b] No; shut down the engine, return, and continue with the initial diagnostics that directed you to Faulty Air Intake Manifold Gasket.

13.9 HIGH INLET AIR TEMPERATURE

To determine if high inlet air temperature is causing lack of power, test/check the radiator fan, fan drive, or fan shroud for proper operation or configuration. Refer to OEM guidelines.

1. If the radiator fan, fan drive, or fan shroud pass the OEM test, return, and continue with the initial diagnostics that directed you to High Inlet Air Temperature.
2. If the radiator fan, drive or shroud did not operate correctly, refer to section 13.9.1.

13.9.1 Radiator Fan, Drive and Shroud Replacement

Perform the following steps to replace the radiator fan, drive, and or shroud:

1. Remove and replace the radiator fan, drive, and/or shroud; refer to OEM guidelines.
2. Verify replacement; refer to section 13.9.1.1.

13.9.1.1 Test the Engine with the Radiator Fan, Drive and Shroud Replacement Replacement(s)

Perform the following steps to determine if replaced radiator fan, fan drive, or fan shroud resolved lack of power condition:

**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.

**WARNING:****PERSONAL INJURY**

To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

**WARNING:****PERSONAL INJURY**

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

1. Start and run the engine.
2. Test drive the vehicle to ensure lack of power has been resolved.
 - [a] If no lack of power occurred during the test drive, no further troubleshooting is required. Shut down the engine.
 - [b] No; shut down the engine, return, and continue with the initial diagnostics that directed you to High Inlet Air Temperature.

