HARD START (LONGER THAN NORMAL CRANK TIMES)

Engine cranking time depends on battery voltage, cranking speed, engine temperature, ambient air temperature, fuel type, and oil viscosity. Typical cranking times range from two to five seconds. If crank times are extended out of this range in normal conditions, there may be a fuel system issue that may need to be addressed.

**WARNING:**

**BODILY INJURY**

To avoid injury from an explosion, do not use ether or starting fluid on engines equipped with a manifold (grid) heater.

**NOTICE:**

To avoid engine damage, do not use ether or starting fluid on engines equipped with a manifold (grid) heater.

Check as follows:

1. Use DDDL to check for stored or active codes and repair as necessary.

<table>
<thead>
<tr>
<th>Stored or Active Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stored or Active codes:</td>
</tr>
</tbody>
</table>

**NOTE:** Write any apparent stored or active codes in this table.

2. Did the symptom appear after a fuel filter service, fuel system repair or when the truck was delivered from the factory?
   
   **[a]** Yes, refer to section "Fuel System Priming" in the *DD13/DD15 Troubleshooting Guide* (DDC-SVC-MAN-0029).
   
   **[b]** No, go to next step.
To avoid injury from fire, keep all potential ignition sources away from diesel fuel, including open flames, sparks, and electrical resistance heating elements. Do not smoke when refueling.

3. Check the fuel level in both fuel tanks to verify sufficient fuel supply.
   [a] If fuel level is low, add fuel until the fuel level is at least 3 inches over the pickup tubes in the fuel tank. Run the engine for 3 minutes at 1800 RPM to clear any air out of the fuel system and retest.
   [b] Fuel level OK, go to next step.

<table>
<thead>
<tr>
<th>Fuel Tank Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel Tank 1:</td>
</tr>
<tr>
<td>Fuel Tank 2:</td>
</tr>
</tbody>
</table>

NOTE: Write tank 1 and tank 2 fuel levels in this table.

4. Use DDDL to insure that cranking speed is over 150 RPM.
   [a] Cranking speed is over 150 RPM, go to next step.
   [b] Cranking speed is under 150 RPM, refer to section "Starting Difficulty" in the DD13/DD15 Troubleshooting Guide (DDC-SVC-MAN-0029) to determine the cause of low crank speed.

5. Does crank time change based on the time that the engine has been shut down?
   [a] Yes, go to the next step.
   [b] No, check for internal engine issues; battery voltage, crank speed, low compression, or poor fuel quality.

<table>
<thead>
<tr>
<th>How long does the engine need to sit?</th>
<th>List internal engine issues (if any).</th>
</tr>
</thead>
</table>

NOTE: Write the information in this table.

   [a] If low pressure fuel system pressures are OK, go to the next step.
If low pressure fuel system pressures are NOT OK, repair as necessary.

<table>
<thead>
<tr>
<th>Low Pressure Fuel System Pressures</th>
<th>600 RPM</th>
<th>1800 RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low pressure fuel pump in:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low pressure fuel pump out:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High pressure fuel pump in:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High pressure fuel pump out:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Priming Port Pressure:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** List low pressure fuel system pressures in this table

7. Check for internal or external low pressure fuel system leaks. Refer to section "Internal and External Low Pressure Fuel System Leaks" in the *DD13/DD15 Troubleshooting Guide* (DDC-SVC-MAN-0029).
   
   [a] If NO leaks are found, go to the next step.
   
   [b] If leaks are found, repair as necessary.

8. Check for aerated fuel. Refer to section 5.4 "Aerated Fuel."
   
   [a] If fuel is aerated, repair as necessary.
   
   [b] If fuel is NOT aerated, go to next step.

9. Remove the bypass valve (1) from the fuel module, inspect the valve for debris. See Figure 1.
   
   [a] If debris is found, clean or replace the valve.
[b] If no debris is found, reinstall the valve and go to the next step.

Figure 1  Bypass Valve

10. Remove the two-stage valve (1) from the high pressure pump and inspect for debris, check if the valve is stuck open. See Figure 2.

[a] If debris is found or if the valve is stuck open, replace the high pressure fuel pump. Refer to section 35.1 "High Pressure Fuel Pump."
11. Remove the relief valve (2) from the high pressure fuel pump and inspect for debris, check if the valve is stuck open.

[a] If debris is found or if the valve is stuck open, replace the high pressure fuel pump. Refer to section 35.1 "High Pressure Fuel Pump."

[b] If no debris is found, reinstall the valve and go to the next step.

**Figure 2 Two-Stage Valve and Relief Valve**

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[a] If the RPBO test passes, go to step 5.

---

**WARNING:**

**ENGINE EXHAUST**

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.
[b] If the RPBO test fails, go to next step.

<table>
<thead>
<tr>
<th>RPBO Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>RPBO Time:__________________________________________</td>
</tr>
</tbody>
</table>

NOTE: Write the RPBO time in this table.


   [a] If leak(s) are found, repair leak(s) and prime the fuel system. Start the engine and verify repair.

   [b] If no leak(s) are found, go to the next step.

<table>
<thead>
<tr>
<th>Leaking From</th>
</tr>
</thead>
<tbody>
<tr>
<td>Where are the leaks coming from?___________________________________________________________________________</td>
</tr>
</tbody>
</table>

NOTE: Write where the fuel system is leaking from in this table.


   [a] If there are NO cylinders above 70% or below -70%, go to the next step.

   [b] If there IS a cylinder above 70% or below -70%, remove that injector line and cap off the rail with J-48704. Run the RPBO test again. If the RPBO test passes, change the injector that is capped off and verify repairs.

<table>
<thead>
<tr>
<th>ISB Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cylinder 1%:_____________________  Cylinder 4%:_____________________</td>
</tr>
<tr>
<td>Cylinder 2%:_____________________  Cylinder 5%:_____________________</td>
</tr>
<tr>
<td>Cylinder 3%:_____________________  Cylinder 6%:_____________________</td>
</tr>
</tbody>
</table>

NOTE: Write ISB values in this table.


   [a] If the PLV is leaking, replace the PLV and verify repairs.

   [b] If the PLV is not leaking, replace the high pressure fuel pump and verify repair. Refer to section 35.1 "High Pressure Fuel Pump."

<table>
<thead>
<tr>
<th>Leaking From</th>
</tr>
</thead>
<tbody>
<tr>
<td>Where are the leaks coming from?___________________________________________________________________________</td>
</tr>
</tbody>
</table>

NOTE: Write where the PLV is leaking from in this table.
16. Install a priming port gauge and start the engine. Turn the engine OFF and watch for fuel pressure to drop when the engine is shut down.

[a] If the pressure drops to 0 within 3 seconds after engine shut down, inspect the check ball under the pre-screen filter for proper seating. If the check ball is missing or is not seating properly, repair or replace the fuel filter module.

[b] If the pressure DOES NOT drop to 0 within 3 seconds, go to the next step.

How many seconds is the bleed down? ________________________________

NOTE: Write bleed down seconds in this table

17. Remove the needle return line and fitting from the fuel filter module. Inspect the check valve in the fitting for debris.

[a] If there is debris, clean or replace the check valve.

[b] If there is no problem with the check valve, replace the high pressure fuel pump and verify repairs. Refer to section 35.1 "High Pressure Fuel Pump."
ADDITIONAL SERVICE INFORMATION

Additional service information is available in the Detroit Diesel EPA07 DD15 *Fuel System Technicians Guide*, (DDC-SVC-MAN-0037). The next revision to this manual will include the revised information.