

## **GM and Ford IDI Diagnostics Stanadyne DB2 Mechanical Pump**

### **Hard Start/No Start Cold - White Smoke**

- The fact there is smoke indicates that there is fuel in the cylinders, so it is likely a cylinder heat, compression, or timing issue.
- 1. Check glow plug operation- Verify there is voltage at the relay terminals and glow plug terminals when the key is cycled to the on position and the glow plug lamp is illuminated. If not, the relay and/or controller are likely bad. Glow plug cycle time should be around 8-10 seconds for the pick-ups/vans/Blazer/Suburban, up to 15 seconds for GM CUCV military vehicles.
- 2. If there is voltage, ohm the glow plugs with the wires disconnected. The ohm readings should be between .4-.8 ohms typically. If the reading is high or open, the glow plug is bad. Open or high resistance can cause short cycle times with the later Ford solid state controllers.
- 3. If the glow plugs are operating normally: Low engine compression, incorrect injection pump to engine timing, poor quality/incorrect fuel will all also cause a hard start cold with white smoke.
- 4. Verify that cranking speed is at least 100 RPM.

### **Hard Start, Cold or Hot - No Smoke**

- The lack of smoke generally means no or insufficient fuel is entering the cylinder.
- 1. Verify that cranking speed is at least 180-200 RPM if engine is hot, minimum 100 rpm cold.
- 2. Check for 12 volts at the shut off solenoid connection on the injection pump with the key on. Also listen for a “click” when power is applied.
- 3. Verify that there is a good, clean, and not aerated fuel supply at the injection pump. Tee in a gauge and clear line at the pump inlet or as close as possible to the pump inlet to get a pressure reading and visually check for air bubbles. Fuel supply pressure should be roughly 4-8 PSI for most all DB2 model pumps.
- 4. If the pump was just installed and not properly bled there could be an airlock. Loosen one injection line and plug in/unplug the shutoff solenoid a few times until you get fuel out the line then tighten that line and go to the



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next injection and repeat to be sure there is not an airlock.

5. Loosen several injection lines at the injector end and crank the engine. If there is good fuel supply to the pump and no fuel being delivered within 30 seconds total of cranking, then the pump is likely defective.

### Surges while Running

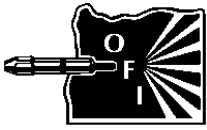
- Surging can be caused by either fuel supply problems or mechanical problems within the injection pump itself.
1. Check for air in the fuel supply system. Check for air at the bleeder valve on the filter head. If air comes out when the bleeder is opened there is air in the system.
  2. To find the source of the air, install a clear line at the suction side of the supply pump and start the engine. If there is air in the fuel, move the clear line to the next available location in the supply line from the fuel tank, such as a primary filter, hose connection at a tank switch valve, ETC. When you stop seeing air in the fuel, then the component you have isolated is at fault. Common items that suck air are old fuel lines, bad o rings in quick connect fittings, tank switch valves, primary fuel filters (especially early 6.9l Fords), and fuel supply pumps.
  3. If there is no air in the fuel supply and the engine is surging, it is very likely that there are worn or sticking governor components in the injection pump.
  4. If the cold advance solenoid is stuck on with constant power due to a bad cold start switch, the engine may surge.

### Starts and Then Dies

- A start and die issue is normally caused by a drain back issue in the fuel supply system or low idle speed. If the engine started right away it is typically not a glow plug issue.
1. If the engine runs for less than 1 or 2 seconds, dies, and restarts immediately then the problem is usually too low of an idle speed, no cold start fast idle, or incorrect timing.
  2. If the engine runs for ½ -10 seconds then dies and is difficult to re-start, it is most likely a drain back issue. External fuel leaks can indicate a problem area. Check the injection pump throttle shaft, advance plunger seal, injector returns and fuel supply lines. If you are seeing damp areas,

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but no visible fuel, this could still cause the drain back issue because air can get in where fuel can't get out. The fuel filter check valve on 7.3L engines is also known problem area for this complaint. The longer the engine runs before it dies, the further back toward the tank the problem is.

3. If the return fitting on the injection pump is plugged or the return to the tank is restricted it will also cause a start then die issue.

### Dies on Deceleration

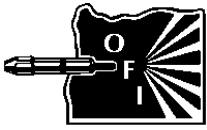
- This is a common problem with low lubricity fuels, which cause slow response from the metering valve in the injection pump or when a vehicle has been sitting unused for some time.
1. If the engine dies when the operator lets off of the throttle but the engine easily restarts, it is possible that the idle RPM are just set a little too low. It could also be low lubricity fuel. Try using Stanadyne Performance formula fuel additive; this will often solve a “dies on deceleration” problem after just a short drive.
  2. If the engine dies and then is slow to restart, the problem could be a sticking metering valve in the injection pump. Low lubricity fuels, old gummy fuel, or water contamination can lead to this problem. Check the fuel filter for signs of water or other contamination which would indicate a likely pump failure. Use a lubricity additive, such as Stanadyne Performance Formula, and see if the problem clears up. If not, the injection pump may need replaced.

### White Smoke (may also be blue/white)

- White smoke with a fuel smell is caused by incomplete combustion in the cylinder. Unburned fuel smoke will burn your eyes.
1. Verify pump to engine timing: Use a timing meter or timing light with a diesel adapter to verify dynamic injection pump timing. Retarded timing or timing that is too far out of range either way will cause white smoke. IF the smoke is mainly when the engine is cold, make sure the cold advance solenoid in the injection pump is receiving power until the engine reaches approximately 120 degrees coolant temperature.
  2. Make sure the fuel supply is clean, not aerated, and the correct fuel. Old poor quality fuel or a gas/diesel mix will cause white smoke due to

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incomplete/incorrect combustion.

3. Coolant or oil in the combustion chamber can cause white smoke, but this smoke usually smells sweet (coolant) or oily (oil). If it is oil smoke; how many miles per quart of oil burned?
4. Low engine compression will cause white smoke.
5. An injector with a leaking or stuck nozzle may cause white smoke and is usually accompanied by a fuel knock. Crack open fuel lines to see if knock goes away.
6. A worn injection pump can cause white smoke at all times.

### Black Smoke

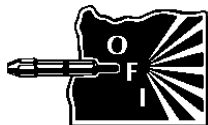
- Black smoke is caused by excessive fuel or a lack of air flow (or both) into the cylinder, causing a fuel “rich” condition. It should also be noted that some light black smoke at high RPM, under load, and/or at higher altitudes is typical of a naturally aspirated IDI diesel engine.
1. Check the air filter. This is often overlooked and is a simple fix.
  2. Verify pump to engine timing. Over advanced timing can contribute to black smoke.
  3. If the engine is turbo charged, after market or OEM, verify boost pressure is within specification (usually 8-12 PSI). If not, look for exhaust leaks pre-turbo, exhaust restriction post-turbo, air inlet restriction, or boost leaks.
  4. Worn injectors may cause black smoke due to poor spray patterns, leaking tips, and/or incorrect timing (low opening pressures).
  5. A worn injection pump can cause black smoke due to worn advance components, worn governing parts, and/or incorrect calibration.
  6. If the engine is equipped with EGR (some 6.2l and 6.5l engines), the system can malfunction and cause black smoke and low power.
  7. Aerated fuel may cause black smoke with out surging or dying (usually on the 7.3L).

### Miss, Rough Run

- A miss that can be isolated to one cylinder is probably not an injection pump issue, more commonly it will be an injector or base engine problem. A miss that can not be isolated to one cylinder is most likely an injection pump related problem or engine balance issue (dual mass flywheel, balancer, ETC.).

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1. Try to isolate the problem to one cylinder by cracking the injection lines one at a time while the engine is running and listening for a change in the engine. If there is no or very little change, that is the problem cylinder. Check all components related to that cylinder specifically, such as the injector, valve train, and compression.
2. If the problem can not be isolated, check the flywheel (manual transmission), flex plate (auto transmission), vibration dampener (balancer), fan clutch, ETC. for any signs of failure or excessive play.
3. Check idle speed: Too low of an idle speed can make the engine feel like it is running rough, especially when the transmission is in gear or the engine is loaded at idle (A/C compressor).
4. If no other problems are found, it is likely an injection pump problem.

### Low Power

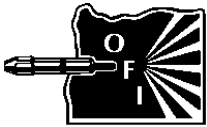
1. Make sure the injection pump is getting full throttle travel. Worn linkages, cables, and levers can limit throttle travel.
2. Check pump to engine timing.
3. If turbocharged, see "Black Smoke"
4. Verify a good fuel supply to the injection pump, 4-6 PSI supply pressure with no aeration.
5. Check/test the injectors. Low opening pressures, poor spray patterns, and worn nozzles will contribute to low power.
6. Determine the condition of the injection pump by measuring return fuel from the return fitting at the injection pump. If return quantity exceeds 450 cc in one minute at idle, then the injection pump is worn out.
7. If the engine is equipped with EGR (some 6.2l and 6.5l engines), the system can malfunction and cause black smoke and low power.

### Dies While Driving

- If the engine dies or has a sever power loss power while under a load the problem is most likely fuel supply related.
1. **CHANGE THE FUEL FILTER.** Verify that the injection pump has a good, clean, not aerated fuel supply. Check pressure while driving. If the pressure falls off when the problem occurs then there is a problem in the supply system.
  2. Check for a restriction on the suction side of the fuel system (supply pump

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- inlet). A normally operating fuel system will have less than 5" of restriction under load. If it is higher, there is a restriction in the fuel lines or fuel tank. There is normally a pick up sock or fuel strainer in the tank.
3. If restriction is OK, the fuel filter is clean, there's no air in the fuel supply, and there's still a fuel supply pressure problem, then change the fuel supply pump.

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