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Power Stroke 6.0L Diagnostics

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This bulletin is intended to aid technicians in the correct procedure of performing diagnostics on a Power Stroke 6.0L.

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Powerstroke 6.0L Diagnostics

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Tools Needed: IDS Scan Tool, misc tools, service manual

Preliminary Checks

1. Ensure you have adequate fuel plus no contamination
2. Engine Oil Level
3. Check Air Filter AND FUEL filter (Primary (in HFCM) and Secondary (On top of engine in front) Ensure o ring seals are round and not pinched or distorted due to over tightening caps.
4. State of Charge of the Batteries (Check separately) Perform load test
5. Measure Fuel Pressure (45PSI Minimum)
6. Check coolant level and for contamination (EGR Cooler leak)
7. Smoke: What does color indicate?
    a. Black- overfueling
    b. Blue- Oil
    c. White-unburnt fuel
    d. Water or moisture-Head gasket or EGR Cooler leak
8. Install IDS Scan Tool
9. If no start condition check the following under Data Logger while cranking

Scan Data	Reading
a. ICP	ICP Desired (Greater than 510PSI)
b. ICP Desired	ICP Desired (Greater than 510PSI)
c. SYNC	YES (Reading should stay fixed)
d. FICM SYNC	YES (Reading should stay fixed)
e. FICM V	Battery Voltage
f. FICM Main	Greater than 46V no less than 44V
g. BAT	Battery Voltage

10. If vehicle runs or runs rough, check the following under Data Logger (engine) while idling:

Scan Data	Reading
a. ICP	ICP Desired (Greater than 510PSI)
b. ICP Desired	ICP Desired (Greater than 510PSI)
c. SYNC	YES (Reading should stay fixed)
d. FICM SYNC	YES (Reading should stay fixed)
e. FICM V	Battery Voltage
f. FICM INJ V	Greater than 46V no less than 44V
g. BAT	Battery Charging System Voltage
h. EGRVP	0%
i. EGRDC#	0%
j. APP	0% (reading taken with no effort on pedal)

If vehicle has no scan tool communication and runs rough or hard start, disconnect the following:

a. Disconnect the EBP Sensor (this sensor if shorted will cause no start)
b. Disconnect the Glow Plug Controller (This unit shorted will cause Glow Plug light on and not start) or intermittent stalling.

   (Replace EBP sensor or Glow Plug Controller if engine runs upon disconnecting them)

Perform Cylinder Balance Graph Test

1. Check the performance of each cylinder. Ensure that all cylinders are even and are contributing engine power.
2. Perform the cylinder kill portion of the graph and compare the signatures of each RPM drop of each cylinder. They should be even. This can be seen by observing the signature the graph leaves for each cylinder firing event.
3. Note: If you have a cylinder graph where a cylinder is rising it is overfueling due to a leaky injector or an oil saturated intercooler.
4. “Stiction” is a term where we have seen injector spool valves stick intermittently. Mostly seen with a cold engine. Symptom is you will observe balance graph showing a miss on a cylinder but as the engine is warmed up it will then fire correctly. This can also be a random miss. Injector will require replacement.

Perform Self tests and retrieve DTCs

1. Perform Self tests
    a. KOEO Self Tests- Injector
    b. KOER Self tests
2. Retrieve CMD Continuous Memory Codes
3. Follow diagnostic charts and check there are no flash updates addressing the issue.

Perform the Air Bubble Test

1. Air in the fuel system will be checked by first removing the secondary fuel filter
    a. Disconnect the Fuel Pump at the HFCM in the chassis.
    b. Disable the FICM by disconnecting the FICM Relay
    c. Ensure fuel is present in secondary fuel filter housing with filter removed.
    d. Have a technician crank the engine while you analyze the fuel in the filter housing. If there are bubbles, you have air in the system.
    e. If there are bubbles, you need to find if leak is on Passenger side or driver side. Perform the Balloon or air test. (Cause? Possible injector overtightening and/or copper seal failure.

Balloon Test

1. Remove fuel lines from the secondary fuel filter to the cylinder heads (Two lines)
2. Upon removing each line you can either fasten a balloon or a hose.
3. If you decide on using the hose, insert other end of hoses into a glass or water.
4. Disable fuel pump and disconnect FICM Relay. Crank engine
5. While cranking observe balloons to inflation or for bubbles if you used hose.
6. If one lines has evidence of air by either inflating the balloon or blowing bubbles, you have isolated the bank that has an air leak. Remove the four injectors on that bank to find leak.

    (Note: If air is not present ensure there is no air in the fuel system at the HFCM. This is located in the chassis at the primary filter. Hook up a clear line on the return to tank line. If there is air present, you need to check o ring seals on the primary filter cap.)

ICP Pressure

BEFORE YOU DIAGNOSE ICP PRESSURE ISSUES, ENSURE OIL LEVEL. REMOVE IPR AND INSPECT FOR CONTAMINATION. It is assumed after you measure and confirm engine oil pressure. (You can measure engine oil pressure at the engine oil temperature sensor.)

1. Contaminated?
    a. HP Oil pump needs to be replaced
    b. Check screen at the bottom of the oil reservoir which is underneath the oil cooler.
    c. Snuber valves need to be checked for metal. (located on the inlet of the oil rail on a 2003 model. Located in the end of the standpipes in a 2004 and later model.)
2. Check IPR Duty cycle. Verify that during a given engine speed, duty cycle should not be fluctuating dramatically.
3. If no ICP Pressure, find leak. ON 2004 models, make sure you perform a leak test. Use shop air through the ICP sensor hole and listen for an air leak. (Note it is normal to hear a small hiss of air through the injectors. You will be able to distinguish the difference between a failure leak and an injector hiss.
4. Certain engines will have intermittent “fish bite” driveability issue. A miss but with a snap as with a fish bite on a line. ICP sensor should be disconnected and test.
5. O rings are now becoming more apparent to fail, they cause leaks on the outlet of the pump. If o ring is blown or ripped, do not just replace o ring, replace HP pump and flat fitting.
6. There have been leaks found on the side of the HP oil pump. There are bearings that were pressed in to seal. These have been known to pop out. Check for leaks on the side of the HP oil pump. (03 and 04 models)
7. 2003 engines with the ICP sensor in the back underneath the turbocharger next to the IPR valve, they are known to cause oil leaks. Care in touching since they are brittle.
8. It is normal to find a small hissing sound from the injectors through their exhaust ports.

VGT Turbocharger

1. Perform KOER Self Test.
2. Check visually turbo vanes for damage or binding
3. Ensure there are no intakes leaks in the plumbing and the intercooler.
4. As you observe in Datalogger, view the following PIDS:
    a. VGT
    b. RPM
    c. MGP Manifold Gauge Pressure
    d. EBP A
    e. EBP G
5. As you select VGT # , raise engine speed and observe MGP as you command the VGT open to closed. 0-80%.
6. MGP should rise and EBP A as well.
7. Perform the VGT test in the powertrain tests in IDS.
8. Note, sticky VGT turbos can be misleading, carbon or coaking can exist in the vanes but the VGT solenoid and the rack and pinion within the VGT can also be sticky. Inspect the solenoid for sticking and ensure the pinion is not binding.

EGR Exhaust Gas Recirculation

1. An EGR valve that is stuck open over 60% can cause a no start condition depending on the amount of carbon buildup in the intake manifold.
2. Perform the EGR Test in the Powertrain section of IDS.
3. Using Datalogger select the EGR PIDS and MAF PID if available.
4. Check for EGRVP not open above 0%
5. Using IDS, open the EGR # and observe EGRVP.
6. For driveability issues, test drive vehicle and ensure the desired EGR position matches the actual position (EGRVP)
7. Note 2004 models use a EGR throttle plate (EGRTP) ensure that is not stuck closed.
8. Observe carbon buildup in intake and service if needed.
9. Clean EGR and reseal.
10. With EGR removed and electrically connected, check EGR movement by opening and closing the valve using the EGR # command in IDS datalogger. Check for binding and sticking with KEY on engine off.
11. Note: BG Offers a kit to clean the intake and EGR for excessive carbon in the intake. We have used it successfully to clean intakes and EGR.

Crankshaft and Camshaft Position Sensors (CKP and CMP)

1. You have confirmed CKP and CMP Operation when you check the SYNC PID and the FICM SYNC PID.
2. You may have an intermittent situation where you are losing the SYNC signal. This is observed when you find a YES message change to NO and back to YES and engine stalling and perhaps an intermittent no start condition.
3. First if you have a no start condition and you confirmed it is a NO message SYNC condition, check wiring and connections at the sensors and the PCM(at left fender next to battery)
4. According to Ford Service Information if you have a loss of CKP sensor, your ICP Pressure will default to 14% and ICP Pressure will be 300PSI (You need 500PSI-510PSI to start)
5. If you have no CKP reading, you will measure the resistance of the sensor. Not always conclusive with both the CKP and CMP sensors. The best way to check is with a labscope. If not many repair facilities have been known to have a spare to replace with and test.
6. Recently we have found no SYNC due to no CKP input. Sensor has been checked and circuits fine. We have needed to use a Borescope to check through the CKP hole for reluctor wheel presence. This can cause an intermittent no start due to crankshaft end play and wear.
7. Care in removing the CMP sensor it can be brittle. Try not to twist but pull the sensor when removing.

Thanks to all facilities that have worked with me in making this sheet (and those trucks I have repaired and diagnosed!). There is more to follow. This is typed to aid you in your diagnostics. Any input would be appreciated to help us and technicians in our line of work.

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