F-Series Powerstroke 1999 1/2

7.3 Power Stroke Diesel Engine Diagnostic Guide

-NOTE-
IF CONCERN IS FOUND, SERVICE AS REQUIRED. IF THIS CORRECTS THE CONDITION, IT IS NOT NECESSARY TO COMPLETE THE REMAINDER OF THE DIAGNOSTIC PROCEDURE.

CUSTOMER NAME	
MODEL YEAR	VEHICLE SERIAL N0.(VIN)
CHASSIS STYLE	

Customer Concerns (Please list in this box)

DEALER NAME			P & A CODE					1863 CLAIM NUMBER	DATE
	ENGINE SERIAL NUMBER						ODOMETER	TYPE OF SERVICE	
VEHICLE GVW	TRANSMISSION	AMBIENT TEMPERATURE						PERSONAL ☐	COMMERCIAL ☐

Hard Start/No Start Diagnostics

NOTE: A hard start/ No start concern with EOT Temp. below 60F perform step 10 first.

1. Visual Engine/Chassis Inspection 6005E

Fuel Oil Coolant Electrical Hoses Leaks

Method	*Check*
Visual	

2. Check Engine Oil Level See Fig. C 6005E

- Check for contaminants (fuel, coolant).
- Correct Grade/Viscosity.
- Miles/Hours on oil ,correct level.
- Check level in reservoir.

Method	*Check*
Visual	

3. Intake/Exhaust Restriction See Fig. B & L 6005E

- Inspect air filter and ducts - exhaust system
- Inspect exhaust back pressure device

Method	*Check*
Visual	

4. Sufficient Clean Fuel See Fig. A 6005E 6

- Check if the WATER IN FUEL lamp has been illuminated.
- After verifying that there is fuel in the tank, drain a sample from fuel filter housing at key on.

NOTE: Fuel pump will run for 20 sec. at key on.

Method	*Check*
Visual	

5. Electric Fuel Pump Pressure See Fig. I 6005E 7

- Verify that the fuel pump has voltage and gnd. present at key on.
- Measure fuel pressure at the top of the right cylinder head with a (0-160 PSI) gauge at key on.

Instrument	*Spec.*	*Measurement*
0-160 PSI Gauge	45 PSI min.	

If pressure fails low, Go to step 8c on the Performance side of this sheet to identify cause.

6. Perform KOEO On Demand Test See Fig. E 6005E 2

- Use the NGS Tester
- DTCs set during this test are current faults.

Note: IDM DTCs displayed here could be current or historical faults.

Diagnostic Trouble Codes	

7. Retrieve Continuous Trouble Codes See Fig. E 6005E 2

- DTCs retrieved during this test are historical faults.

Note: IDM DTCs are cleared when codes are cleared

Diagnostic Trouble Codes	

8. KOEO Injector Electrical Self-Test See Fig. E 6005E 3

- Use the NGS Tester.
- All injectors will momentarily buzz, then individual injectors will buzz in sequence 1 through 8.
- IDM DTCs may be transmitted after test is completed.

Note: IDM DTCs may be historical if not cleared above.

Injector Trouble Codes	

9. NGS Tool - Data List Monitoring See Fig. E 6005E 4

- NGS Tester may reset below 9.5 volts.
- Select the parameters indicated from the NGS parameter list and monitor while cranking engine.

Parameter	*Spec.*	*Measurement*
V PWR	*8 volt min.*	

You may need to use a outside power source for the NGS

RPM	100 RPM minimum	
ICP	500 PSI or 3.4mPa min.	
FUEL PW	1 mS to 6 mS	

A . **V PWR** - If indicating a low voltage condition, check battery voltage, charging system or power and ground circuits to the PCM.
GO TO PINPOINT TEST A

B . **RPM** - Low RPM could be an indication of starting/ charging system problems, No RPM indicated with the engine cranking - could be CMP circuit fault, check for Diagnostic Trouble Codes.
GO TO PINPOINT TEST DG

C . **ICP** - A minimum of 500 PSI (3.4 mPa) is required before the injectors are enabled. No or low oil in the reservoir, system leakage, injector O-Rings or faulty IPR could cause pressure loss.
Go to section 4 step 9c in the PC/ED Manual for a detailed description on how to perform this test.
Note: If no RPM signal is received, IPR duty cycle will default to 14%

D . **FUEL PW** - Even though a 1 to 6 mS FUEL PW is shown, its possible the IDM did not receive the signal due to a CI or FDCS circuit fault or internal IDM failure.

10. Glow Plug System Operation See Fig. E & G 6005E 5

Relay Operation

- Glow Plug ON time is dependent on oil temperature and altitude. The Glow Plug relay comes on between 1 and 120 sec. and does not come on at all if oil temp is above 131 F.
- Verify that B+ is being supplied on the large BK/W wire going to the Glow Plug relay.
- Install a voltmeter to the glow plug feed terminal (two brown wires or center terminal on the shunt).
- Using the NGS GPCTM and EOT pids, verify glow plug "on" time .
- Turn key to run position, measure voltage ("on"time) (Dependent on oil temperature and altitude)

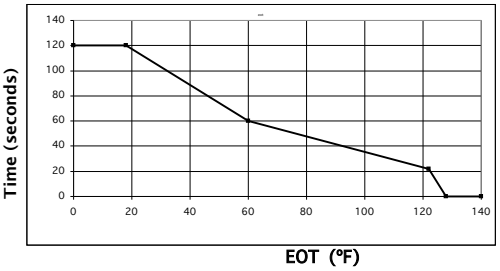
Relay on time	*Spec.*	*Measurement*
1 to 120 seconds	B +	

Note: Wait to Start Lamp "on" time (1 - 10 sec.) is independent from Glow Plug "on" time

Glow Plug Resistance

- Remove both 9 pin connectors from valve covers
- Measure each Glow Plug resistance to Bat. ground.
- Measure engine harness resistance to relay.

Glow Plug Number	Glow Plug to Ground .1 to 2 ohms	Connector to relay or GPCM connector 0 to 1 ohms
#1		
#3		
#5		
#7		
#2		
#4		
#6		
#8		



- Add 5 seconds to glow plug on time when above 7000 feet in altitude, but not to exceed 120 seconds.

See PC/ED manual, Section 4A for more detail on all of the above test steps.

When troubleshooting a Hard Start/No Start or Performance concern, this form must be filled out to the point of repair and returned to receive warranty credit and diagnostic time for the following parts: Fuel Injectors (9E527), regulator-injection control pressure(9C968), pump assemblyhigh pressure oil (9A543), turbo charger assembly/pedestal (6K684), fuel pump (9350), IDM (12B599) and PCM (EEC)(12A650)

Labor operations listed more than once are a continuation of the diagnostic procedure and should be claimed only once.

What problems were found and what repairs were performed?

List Part Name, Number and Serial Number of parts replaced.

F-Series Powerstroke 1999 1/2

7.3 Power Stroke Diesel Engine Diagnostic Guide

-NOTE-
IF CONCERN IS FOUND, SERVICE AS REQUIRED. IF THIS CORRECTS THE CONDITION, IT IS NOT NECESSARY TO COMPLETE THE REMAINDER OF THE DIAGNOSTIC PROCEDURE.

CUSTOMER NAME	
MODEL YEAR	VEHICLE SERIAL N0.(VIN)
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Customer Concerns (Please list in this box)

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VEHICLE GVW	TRANSMISSION	AMBIENT TEMPERATURE	PERSONAL ☐ COMMERCIAL ☐

Performance Diagnostics

1. Visual Engine/Chassis Inspection 6005F

- Verify that there are no fluid, vacuum or pressure leaks.
- Inspect all wire connections for damage.
- Inspect MAP, WGC hoses and intake manifolds for leaks.

Fuel Oil Coolant Electrical Hoses Leaks

Method	*Check*
Visual	

2. Sufficient Clean Fuel See Fig. A 6005F 13

- Check if WATER IN FUEL lamp has been illuminated.
- Drain sample from fuel filter housing at key on

NOTE: Pump will run for 20 sec. at key on

Method	*Check*
Visual	

3. Check Engine Oil Level See Fig. C 6005F

- Check for contaminants (fuel, coolant).
- Correct Grade/Viscosity.
- Miles/hours on oil, correct level.

Method	*Check*
Visual	

4. Intake Restriction See Fig. B 6005F 14

- Check filter minder or measure at WOT with magnehelic gauge.

Instrument	*Spec.*	*Check*
Magnehelic/ Filter Minder	**2"-25" H^20**	

5. Perform KOEO On Demand Test See Fig. E 6005F 1

- Use the NGS Tester.
- DTCs set during this test are current faults.

Note: IDM DTCs displayed here could be current or historical faults.

Diagnostic Trouble Codes	

6. Retrieve Continuous Trouble Codes See Fig. E 6005F 1

- Use the NGS Tester.
- DTCs retrieved during this test are historical faults.

Note: IDM DTCs are cleared when codes are cleared

Diagnostic Trouble Codes	

7. KOEO Injector Electrical Self-Test See Fig. E 6005F 2

- Use the NGS Tester.
- All injectors will momentarily buzz, then individual injectors will buzz in sequence 1 though 8.

Note: IDM DTCs can be historical if not cleared above.

Injector Trouble Codes	

8a. Fuel Pressure at the right head See Fig I. 6005F 16

- Verify that fuel is in the tank and the pump is being powered.
- Measure fuel pressure at the front of right cyl. head
- Road Test- engine at full load condition

Instrument	*Spec.*	*Measurement*
0-160 PSI Gauge	45 PSI min.	

» ***If fuel pressure fails low, Go to step 8c.***
» ***If pressure is above min. spec, Go to step 8b.***

8b. Fuel Pressure at the left head See Fig. I 6005F 17

- Measure fuel pressure at the rear of left cyl. head

CAUTION: Secure hose away from turbo and exhaust

- Road Test- engine at full load condition

Instrument	*Spec.*	*Measurement*
0-160 PSI Gauge	45 PSI min.	

» ***If fuel pressure is below min. spec, replace left check valve***
» ***If fuel pressure is above min. spec, Go to step 9.***

8c. Electric Fuel Pump Pressure See Fig. I 6005F 18

- Measure at fuel outlet from electric fuel pump.
- Road Test- engine at full load condition

Instrument	*Spec.*	*Measurement*
0-160 PSI Gauge	45-80 PSI	

» ***If fuel pressure fails low, Go to step 8d.***
» ***If pressure is above min. spec, replace right check valve.***

8d. Electric Fuel Pump Inlet Restrictio See Fig. H 6005F 19

- Measure restriction at WOT at electric fuel pump inlet

Instrument	*Spec.*	*Measurement*
0-30 " Hg vacuum	6" Hg MAX	

» ***If fuel line is restricted above 6" Hg, check for blockage between pump and fuel tank.***
» ***If fuel line is not restricted, inspect regulator valve condition and for debris, If OK replace pump***

9. Perform KOER On Demand Test See Fig. E 6005F 7

- This will test both ICP and EBP systems for fault.

KOER DTC	

10a. Injection Control Pressure Tests See Fig. E & D 6005F 7

(Oil Aeration - Poor idle quality)

- All acc. off, monitor ICP and RPM with NGS Tester
- Hold engine speed at 3400 RPM for 3 minutes.

Parameter	*High RPM*	*Measurement*
ICP	1800 PSI MAX @ 3400 RPM	

» ***If ICP signal increases above 1800 PSI after 3 minutes anti-foam oil additives may have become depleted from oil, change oil and re-test.***

10b. Low Idle Stability (ICP Pressure) See Fig. E 6005F 8

- Check at low idle, EOT above 180 F
- Monitor ICP and RPM with the NGS Tester

Parameter	*Spec. @ 670 RPM*	*Measurement*
ICP	400 to 600 PSI	
Take reading before disconnecting ICP		

If engine RPM is unstable, disconnect the ICP sensor

» ***If RPM is still unstable, change IPR and re-test.***
» ***If RPM smoothes out, the ICP sensor is at fault.***
Note: ICP will default to 725 PSI when disconnected

11. Crankcase Pressure Test See Fig. J 6005F 9

- Verify engine is at normal operating temp.
- Measure at oil fill with adapter and orifice tool P.N. 5631 & 014-00743 installed.
- Block breather tube on left valve cover.
- Measure at WOT no load.

Instrument	*Spec.*	*Measurement*
Magnehelic 0 to 60" H^20	less than 3" H^20	

If more then 3 " H^20, refer to base engine in Shop Manual

12. Cylinder Contribution Test See Fig. E 6005F 10

- Verify that EOT is above 70 F
- Turn A/C and all accessories off.
- Select Cylinder Contribution from the test menu.

NOTE: The test will run at a idle speed for about 120 sec. and no engine change will be felt during the test

CCT Trouble Codes	

13. Exhaust Restriction See Fig. E & L 6005F 11

- Visually inspect exhaust system for damage
- Verify EBP device is open at WOT in park or neutral
- Monitor EBP with the NGS Tester with the engine
- temperature at 170 ° F minimum at 3400 RPM.

Parameter	*Spec.*	*Measurement*
EBP	34 PSI MAX @ 3400 RPM	

14. Boost Pressure Test See Fig. E & J 6005F 12

- Verify that MAP hose is not damaged, plugged or pinched
- Verify that intercooler hoses or intake are not leaking.
- Verify that the green Wastegate hose is not plugged.
- Monitor MGP (manifold gauge pressure) and RPM with the NGS Tester.
- Road Test - select appropriate gear to obtain desired engine speed and full load on engine. Best accomplished climbing hill or truck fully loaded.

Parameter	*Spec. PSI G*	*Measurement*
MGP	15 PSI G MIN	

See PC/ED manual, Section 4A for more detail on all of the above test steps.

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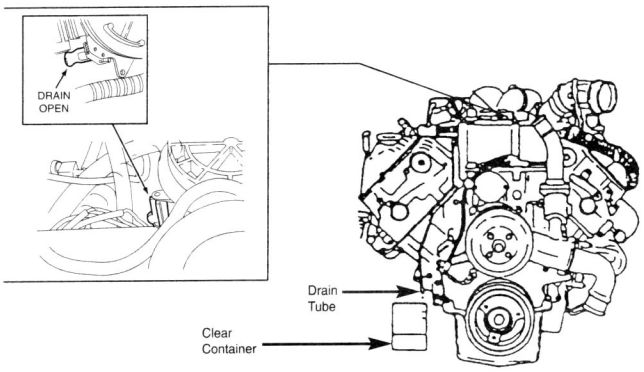
Fuel Injectors (9E527), regulator-injection control pressure(9C968), pump assembly high pressure oil (9A543), turbo charger assembly/pedestal (6K684), fuel pump (9350), IDM (12B599) and PCM (EEC)(12A650)
Labor operations listed more than once are a continuation of the diagnostic procedure and should be claimed only once.

What problems were found and what repairs were performed?

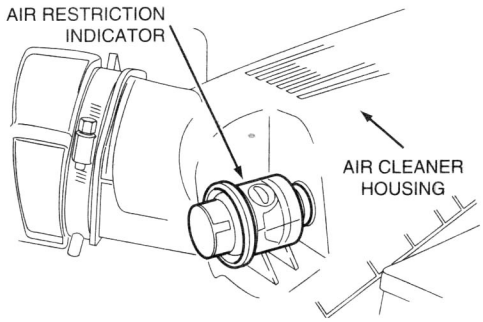
List Part Name, Number and Serial Number of parts replaced.

FIGURE A



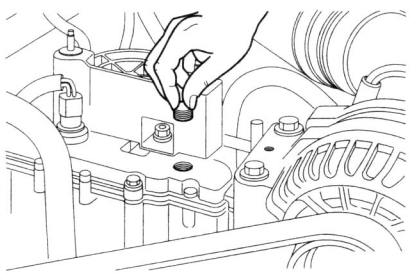
SUFFICIENT CLEAN FUEL

FIGURE B



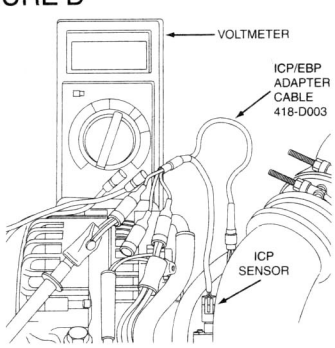
INTAKE RESTRICTION (FILTER MINDER)

FIGURE C



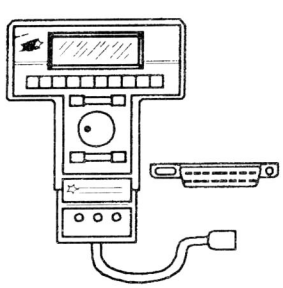
CHECK ENGINE OIL (IN RESERVOIR)

FIGURE D



INJECTION CONTROL PRESSURE

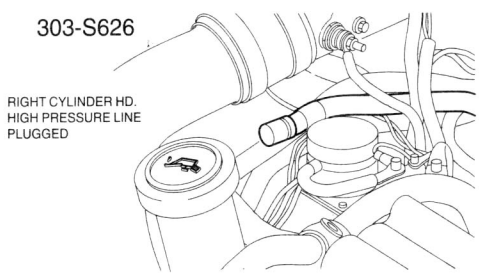
FIGURE E



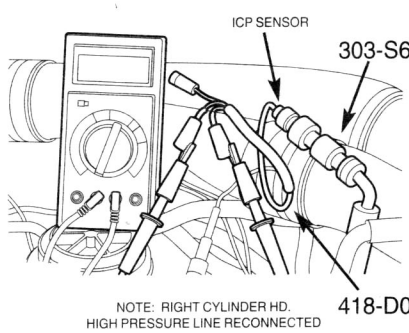
DIAGNOSTIC TESTS WITH NEW GENERATION STAR SCAN TOOL

HIGH PRESSURE LEAKAGE TEST

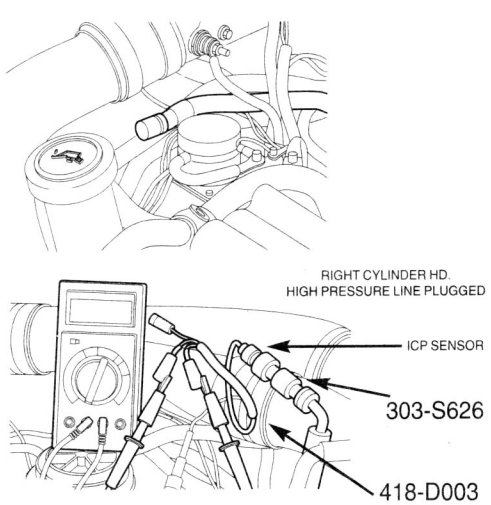
FIGURE F



LEFT CYL. HEAD LEAK TEST



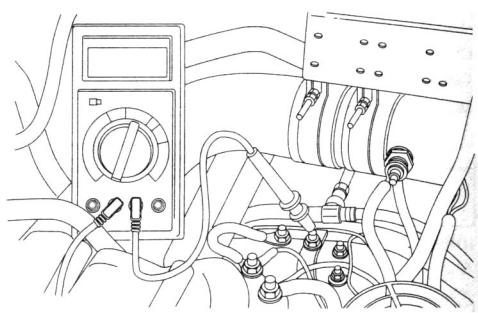
RIGHT CYL. HEAD LEAK TEST



IPR & HIGH PRESSURE PUMP TEST

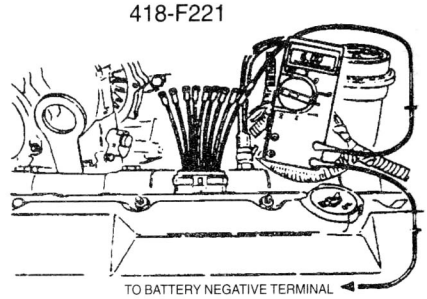
GLOW PLUG SYSTEM OPERATION (NON GPCM EQUIPPED)

FIGURE G

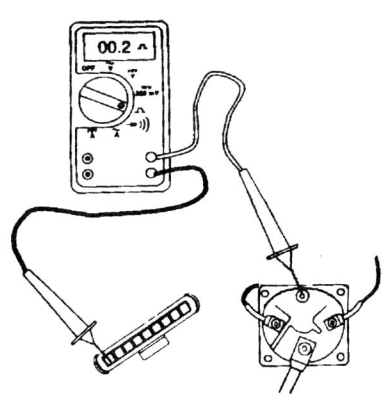


GLOW PLUG "ON" TIME

418-F221

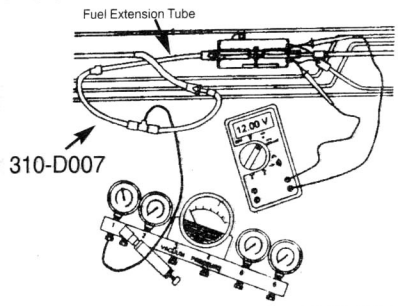


GLOW PLUG RESISTANCE TO GND



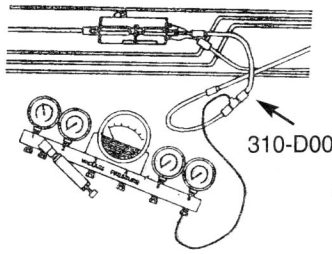
GLOW PLUG HARNESS RESISTANCE

FIGURE H

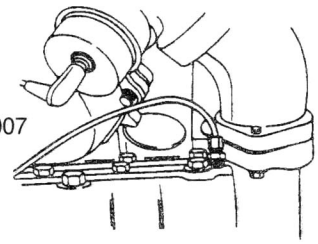


FUEL PUMP RESTRICTION

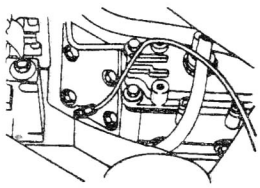
FIGURE I



FUEL PUMP PRESSURE



FUEL PRESSURE (LEFT HEAD)

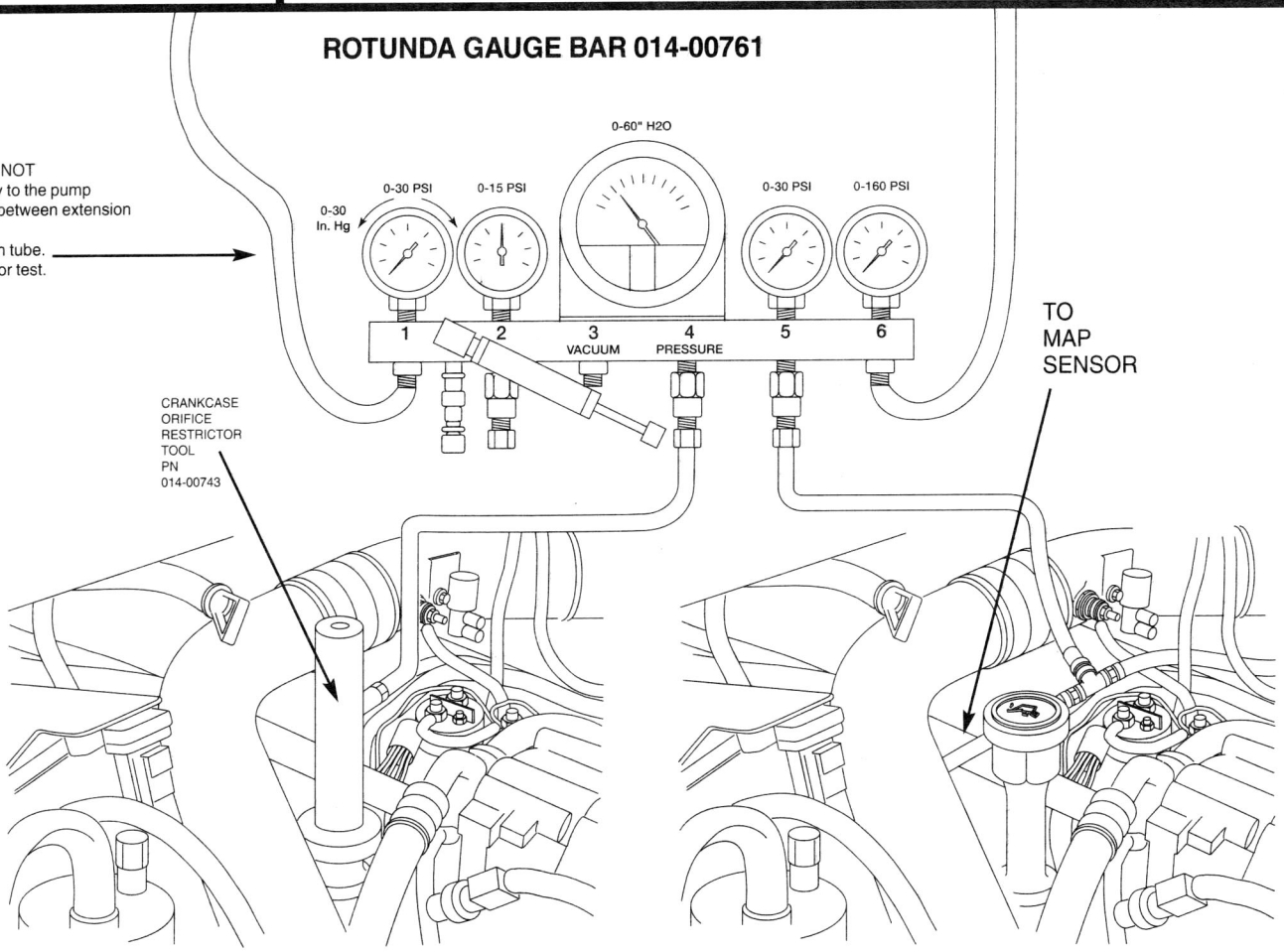


FUEL PRESSURE (RIGHT HEAD)

ROTUNDA GAUGE BAR 014-00761

FIGURE J

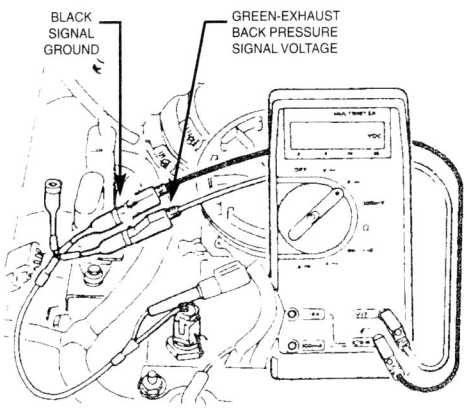
RESTRICTION test – DO NOT connect 310-D007 directly to the pump Test MUST be measured between extension tube and fuel feed line. Econoline is equipped with tube. F-Series needs this tube for test.



CRANKCASE PRESSURE

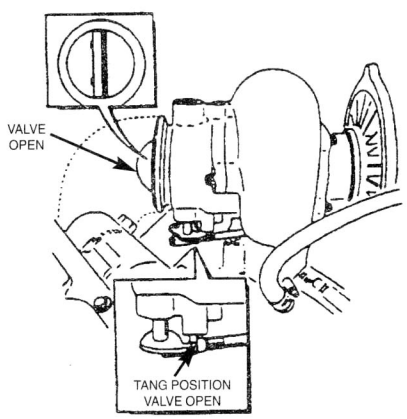
BOOST PRESSURE

FIGURE K



EXHAUST BACK PRESSURE

FIGURE L



EXHAUST RESTRICTION

October 2000