

### 7.3L (IDI Turbo) Diesel Engine Diagnostics Guide

 <b>7.3 IDI TURBO</b>	CUSTOMER NAME	DEALER NAME	P & A CODE	-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.
	MODEL AND YEAR	VEHICLE GVW	TRANSMISSION	
	VEHICLE SERIAL NO. (VIN)	AMBIENT TEMPERATURE	ODOMETER	
	DATE:	ENGINE SERIAL NO.	1983 CLAIM NO.	

**Customer Concerns** (Please list concern(s) in this box).

> If concern is exhaust smoke, see "Evaluating Normal Exhaust Smoke", right lower corner.  
 > If concern is hard start, refer to TSB No.: 80-26-11.  
 > For vehicle performance evaluation, refer to TSB No.: 89-12-8.

## TESTS Page 1 of 4

**UNLESS SPECIFIED ALL TEST ARE TO BE RUN WITH TRANSMISSION IN NEUTRAL (PARK) AND REAR WHEEL OFF THE GROUND**

**1. EXTERNAL LEAKAGE -- See Illustration -- Reverse Side**

Oil     Air Intake     Water     Fuel

Record Location of leaks below in Problem Found box.

INSTRUMENT	1st CHECK	2ND CHECK ♦
Visual Check <input type="checkbox"/>		

**2. ACCELERATOR LINKAGE -- See Illustration -- Reverse Side**

Throttle lever contacts stop at full pedal depression.

INSTRUMENT	1st CHECK	2ND CHECK ♦
Visual Check <input type="checkbox"/>		

**3. EXHAUST SYSTEM CONDITION -- See Illustration -- Reverse Side**

Inspect for dents or kinks which could cause a restriction.  
 Record defects in the Problem found box.

INSTRUMENT	CHECK
Visual Check <input type="checkbox"/>	

**4. TURBOCHARGER BOOST -- See Illustration -- Reverse Side**

Remove air cleaner assembly and connect 0-15 PSI Gauge to the boost test port on the air chamber. Re-install air cleaner.

- With automatic transmission, perform a torque converter stall test (1680 - 2100) RPM. Observe PSI reading.
- With Manual transmission in 2nd gear, accelerate from 1200 to 2800 RPM. Observe PSI reading.

INSTRUMENT	GUIDELINE DATA	1st CHECK	2nd CHECK
0-15 PSI Gauge	5 PSI BOOST MINIMUM		

**NOTE: IF BOOST IS WITHIN LIMITS, PERFORMANCE IS ACCEPTABLE.**

- If boost is low, Go to test 5.

**5. WASTEGATE ACTUATOR CONDITION -- See Illustration -- Reverse Side**

Connect 0-30 PSI Gauge and hand pump to actuator. Apply pressure to actuator with a hand pump. Actuator rod should begin to move at 12-15 PSI. Full actuator rod travel should occur at 20-22 PSI. Observe pressure gauge for 30 seconds after 20-22 PSI has been attained. No decrease in pressure should occur.

INSTRUMENT	GUIDELINE DATA	1st CHECK	2nd CHECK
0-30 PSI Gauge	A) ROD TRAVEL START AT 12-15 PSI		
	B) ROD FULL TRAVEL AT 20-22 PSI		
	C) NO DECAY OF APPLIED PRESSURE		

- If actuator rod fails to move, remove rod from wastegate and check wastegate for freedom of movement.
- If wastegate is free, replace actuator.
- If wastegate will not move, free up wastegate or replace housing containing wastegate.

**6. CHECK FOR FUEL QUALITY -- See Illustration -- Reverse Side**

**A. CHECK FOR AIR IN FUEL**

Install an appropriate length of clear PVC hose in place of the rubber hose on the fuel filter continuous vent. Run engine at 3000 RPM for 2 minutes and observe clear fuel hose for bubbles in fuel with engine at 3000 RPM. Fuel should be free of bubbles within 2 minutes. Correct fuel flow direction is from the fuel filter towards the fuel return system (injection nozzles). Fuel flow in the opposite direction indicates an inoperative check ball in the vent fitting and a restricted fuel supply system.

INSTRUMENT	GUIDELINE DATA	CHECK	
Clear PVC Hose	NO BUBBLES	Front Tank	Rear Tank

- Flow direction OK and bubbles not present - Go to test 6B.
- Flow direction OK and bubbles present - Go to fuel system diagnostic procedure (see Car/Truck Emission Diagnosis Shop Manual, Volume H, and return to test 6A when leak is determined).
- Flow direction NOT OK - Replace continuous vent assembly. - Go to test 6B.

**B. CHECK FOR FUEL CONTAMINATION**

Obtain a fuel sample and visually examine the sample of fuel in a clear container (including bottom of container) for particles, clouding or other liquid contamination such as water. **Sample must be taken at the Fuel Priming Vent (Schrader valve) on the fuel header.**

INSTRUMENT	CHECK
Clear Container	

- If no contamination is found - Go to test 7.
- If contamination is found - replace filter and clean or repair chassis fuel system. Go to test 7.

**7. FUEL SUPPLY SYSTEM -- See Illustration -- Reverse Side**

**A. CHECK FUEL FILTER OUTLET PRESSURE - Record "value" Below**

Measure at 3000 RPM with accessories turned off.

INSTRUMENT	GUIDELINE DATA	1ST CHECK		2ND CHECK ♦	
0 - 15 PSI Gauge and 5651 Adapter	1.0 PSI MINIMUM	Front Tank	Rear Tank	Front Tank	Rear Tank

- If pressure meets guideline, - Go to test 7C.
- If pressure is low - Go to 7B.

**B. FUEL SUPPLY PUMP OUTLET PRESSURE - Record "value" Below**

Remove Fuel Priming Vent (Schrader valve) and install gauge. Measure at 675 RPM with accessories turned off.

INSTRUMENT	GUIDELINE DATA	1st CHECK		2ND CHECK ♦	
0 - 15 PSI Gauge and 3019 Adapter	2.0 PSI MINIMUM	Front Tank	Rear Tank	Front Tank	Rear Tank

- If pressure meets guideline, replace fuel filter and repeat test 7A.
- If pressure is low - Go to 7C.

② Leave adapter 5651 from test 7A installed but capped.

**C. \*\* FUEL PUMP CAPACITY - Record Volume in 30 sec. Below**

Measure at 675 RPM with accessories turned off.

INSTRUMENT	GUIDELINE DATA	1st CHECK		2ND CHECK ♦	
Graduated 1 Qt. Container and 3019 Adapter	MINIMUM OF 1 PINT IN 30 SECONDS	Front Tank	Rear Tank	Front Tank	Rear Tank

- If pressure and volume meet guideline, - Go to test 8.
- Pressure OK and Volume NOT OK - Go to 7D.
- Volume OK and Pressure NOT OK - replace fuel supply pump and repeat test 7A.
- Pressure and Volume NOT OK - Go to 7D.

**D. CHECK RESTRICTION AT SUPPLY PUMP INLET - Record "Value" Below**

Measure at 3000 RPM with accessories turned off.

INSTRUMENT	GUIDELINE DATA	1st CHECK		2ND CHECK ♦	
0 - 30 In.-Hg. Vacuum Gauge and 5632 Adapter	LESS THAN 6 IN.-HG. VACUUM	Front Tank	Rear Tank	Front Tank	Rear Tank

- If vacuum is 6 in.-Hg. or greater - repair restriction in chassis fuel system and repeat test 7A.
- If vacuum is less than 6 in.-Hg. - replace fuel supply pump and repeat test 7A.


**\* SEE REVERSE SIDE FOR TEST HARDWARE INSTALLATION    \*\* ENGINE MUST BE AT NORMAL OPERATING TEMPERATURE**

♦ **2nd CHECK SHOULD BE PERFORMED ONLY AS INDICATED AND TO VERIFY CORRECTIVE ACTION.**

What problems were found and what repairs were performed? \_\_\_\_\_

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

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	MODEL AND YEAR	VEHICLE GVW	TRANSMISSION					
	VEHICLE SERIAL NO. (VIN)	AMBIENT TEMPERATURE	ODOMETER					
	DATE:	ENGINE SERIAL NO.	1863 CLAIM NO.	TYPE OF SERVICE PERSONAL <input type="checkbox"/> COMMERCIAL <input type="checkbox"/>				

**Customer Concerns** (Please list concern(s) in this box).

- > If concern is exhaust smoke, see "Evaluating Normal Exhaust Smoke", right lower corner.
- > If concern is hard start, refer to TSB No.: 90-26-11.
- > For vehicle performance evaluation, refer to TSB No.: 89-12-8.

**TESTS Page 2 of 4**

**8. CHECK FUEL RETURN LINE PRESSURE** - See Illustration - Reverse Side

Check pressure at junction of engine adapter and chassis return hose.

NOTE: Return line removed in test 6A must be reconnected.

- Measure at 3000 RPM with accessories turned off. Record "Value" below.

INSTRUMENT	GUIDELINE DATA	1ST CHECK		2ND CHECK ◆	
		Front Tank	Rear Tank	Front Tank	Rear Tank
0 - 15 PSI Gauge and 5663 Adapter	LESS THAN 2.0 PSI				

**9. AIR INTAKE RESTRICTION** - See Illustration - Reverse Side

- Measure at 3000 RPM with accessories turned off. Record "Value" below.

Reset air filter restriction gauge (filter Minder). Operate engine at 3000 RPM. If no restriction is measured, remove filter minder and install 014-00761 test kit magnahelic gauge and retest restriction.

INSTRUMENT	GUIDELINE DATA	1st CHECK	2nd CHECK
Filter Minder or 014-00761 test kit	BETWEEN 2" AND 30" H2O		

- Filter minder indicates replacement necessary, replace and retest.
- If above 30", replace filter element and retest.
- If less than 2" inspect for leaks in filter system.
- If within guidelines, Go to test 10.

**10. \*\* LOW IDLE (RPM)** - See Illustration - Reverse Side

- Automatic transmission in drive position. - Record "Value" below.
- Manual transmission in neutral position. - Record "Value" below.

INSTRUMENT	GUIDELINE DATA	1st CHECK	2nd CHECK ◆
078-00200 Dynamic Timing Meter and 078-00201 Adapter	SEE EMISSIONS LABEL		

**11. INJECTION PUMP TIMING** - See Illustration - Reverse Side

Attach the clamp to the line pressure sensor on the No. 1 injection nozzle for F-Series (No. 4 for E-Series) and connect the dynamic timing meter. Dial -20 ° offset on the meter. Disconnect cold start advance solenoid connector from the solenoid terminal. Maintain 2000 RPM with engine at operating temperature and record dynamic timing in Box (A). Apply battery voltage to solenoid terminal, maintain 2000 RPM and record dynamic timing in Box (B). (Record "Values" below).

INSTRUMENT	GUIDELINE DATA	1st CHECK	2nd CHECK
078-00200 Dynamic Timing Meter and 078-00201 Adapter	A) 8° ± 2° BTDC @ 2000 RPM		
	B) CHECK WITH POWER TO ADVANCE SOLENOID		

- Advance Timing Check (B) should be 1° (min) more advance than Timing Check (A).
- If (B) is less than 1.0 ° advance from (A), replace fuel injection pump.

**12. CHECK INJECTION PUMP TRANSFER PRESSURE** - See Illustration

- Reverse Side

NOTE: PERFORM ONLY IF 1ST TIMING CHECK (STEP 11) WAS NOT WITHIN SPEC.  
**WARNING: THE COMPRESSOR INLET SAFETY GUARD MUST BE INSTALLED WHEN ENGINE IS RUNNING WITHOUT AIR CLEANER ATTACHED.**

- Measure at 3000 RPM with accessories turned off. Record "Value" below.

INSTRUMENT	GUIDELINE DATA	1st CHECK	2nd CHECK ◆
T83T-9000-A 0-160 PSI Gauge and 5650 Adapter	90 - 120 PSI @ 3000 RPM		

- If pressure is not to specification, replace fuel injection pump.

NOTE: WARRANTY CLAIMS FOR THE INJECTION PUMP WILL NOT BE ACCEPTED UNLESS ALL TAMPER RESISTANT SEALS ARE INTACT AND THE COMPLETED ENGINE PERFORMANCE CHART (VALUES RECORDED) IS SUBMITTED WITH THE RETURNED PART.

**\*\* SEE REVERSE SIDE FOR TEST HARDWARE INSTALLATION \*\* ENGINE MUST BE AT NORMAL OPERATING TEMPERATURE**

◆ 2nd CHECK SHOULD BE PERFORMED ONLY AS INDICATED AND TO VERIFY CORRECTIVE ACTION.

What problems were found and what repairs were performed?

**13. CHECK INJECTION LINES AND INJECTION NOZZLES**

- See Illustration - Reverse Side

NOTE: PERFORM ONLY IF ENGINE IS MISSING OR RUNNING ROUGHLY.

Check injection lines for kinks and/or restrictions. Remove nozzles and test opening pressure and tip leakage on each nozzle. No other evaluation should be performed.

**CAUTION:** Keep hands and other parts of the body away from the spraying nozzle. The liquid discharge leaves the nozzle tip with sufficient force to penetrate the skin and cause serious injury. The nozzle tip should be surrounded by a transparent receptacle if available.

- Connect nozzle to nozzle tester. **Bleed air from nozzle by pumping tester 10 times to insure steady fuel discharge from tip.** Pump tester slowly and record highest pressure reached prior to the nozzle opening (discharging fluid) and Record in Box (A) below.
- Ensure that nozzle body and tip are completely dry before starting test. Operate test to maintain pressure for 5 seconds at 200 PSI below nozzle opening pressure recorded in (A) for each nozzle. Nozzle tip can be wet in 5 seconds but a droplet should not fall.

INSTRUMENT	GUIDELINE DATA								
	ENGINE CALIBRATION			389TR00					
014-00300	CODE ON NOZZLE BODY			G	RECORD				
Injection Nozzle Tester	MINIMUM OPENING PRESSURE			1450 PSI	VALUE BELOW				
NOZZLE #		1	2	3	4	5	6	7	8
(A) Opening Pressure (PSI)									
(B) Tip Leakage (OK / NOT OK)									

• If nozzle is not to specification, replace nozzle assembly. NOTE: WARRANTY CLAIMS FOR REPLACEMENT OF THE NOZZLE(S) WILL NOT BE ACCEPTED UNLESS THE COMPLETED ENGINE PERFORMANCE CHART (VALUES RECORDED) IS SUBMITTED WITH THE RETURNED PART(S).

**14. CRANKCASE PRESSURE** - See Illustration - Reverse Side

Measure pressure at oil fill pipe. Loosen crankcase depression regulator (CDR) valve. Insert clean cardboard between CDR valve and seal ring. Retighten CDR and insure dipstick is seated in tube. Remove cardboard upon completion of test.

- Measure at 3000 RPM with accessories turned off. Record "Value" below.

INSTRUMENT	GUIDELINE DATA	1st CHECK	2ND CHECK ◆
014-00761 Test Kit plus 014-00743 & 5631 Adapters	MAXIMUM PRESSURE OF 6 IN. OF WATER		

- If pressure is not to specification, there is an internal engine concern.
- IF THE PERFORMANCE CONCERN STILL EXISTS AFTER COMPLETION OF THE ENGINE PERFORMANCE CHART REPLACE THE INJECTION PUMP. NOTE: WARRANTY CLAIMS FOR THE INJECTION PUMP WILL NOT BE ACCEPTED UNLESS ALL TAMPER RESISTANT SEALS ARE INTACT AND THE COMPLETED ENGINE PERFORMANCE CHART (VALUES RECORDED) IS SUBMITTED WITH THE RETURNED PART.

**EVALUATING NORMAL EXHAUST SMOKE**

**BLUE-WHITE SMOKE CAN BE OBSERVED**

- After engine startup at all ambient temperatures.
- At low idle speeds after cold engine startup - this smoke will clear up soon after vehicle is driven.
- When ambient temperature is below 50 F, blue - white smoke can return after the engine warm-up period due to extended idling time (ten minutes or more).

**BLACK SMOKE CAN BE OBSERVED**

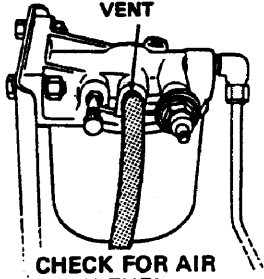
- When pulling hard, such as pulling a steep grade.
- When heavily loaded, such as pulling a trailer or operating with a heavy load in the truck bed.
- During heavy acceleration.

THIS GUIDE SHOULD BE USED IN CONJUNCTION WITH THE CAR/TRUCK  
SHOP MANUAL - "ENGINE/EMISSIONS DIAGNOSIS" - VOLUME H.

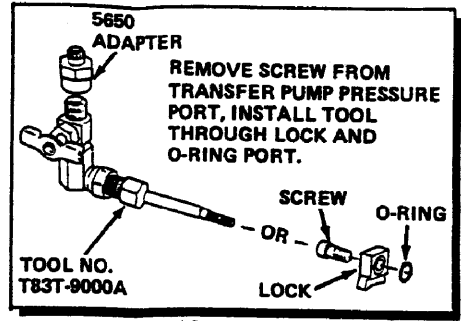
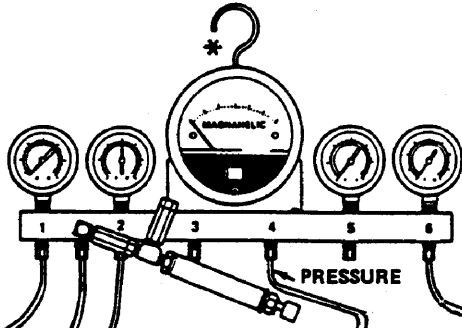


# SETUP ILLUSTRATION OF ROTUNDA™ 014-00761 PRESSURE TEST KIT AND TEST FITTINGS

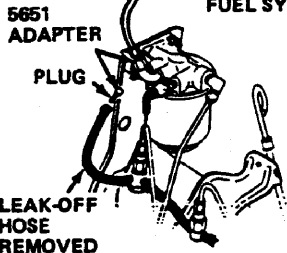
CONNECT CLEAR PVC TEST HOSE AT CONTINUOUS VENT



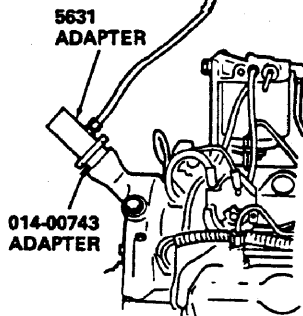
CHECK FOR AIR IN FUEL TEST 6A



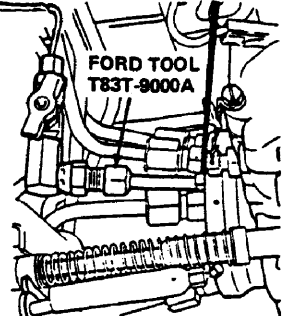
TO CHASSIS FUEL SYSTEM



CHECK FUEL FILTER OUTLET PRESSURE TEST 7A

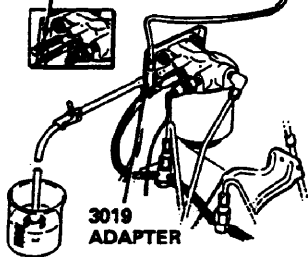


CRANKCASE PRESSURE \* TEST 14



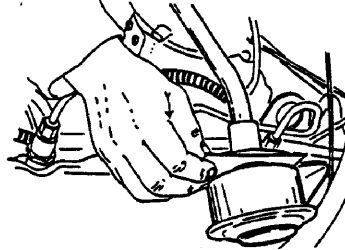
INJECTION PUMP FUEL TRANSFER PRESSURE TEST 12

REMOVE FUEL PRIMING VENT

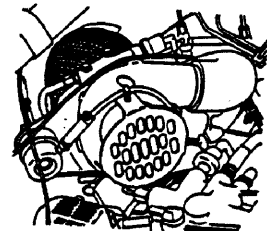


SUPPLY PUMP OUTLET PRESSURE & CAPACITY TEST 7B & C

- LOOSEN CDR FASTENERS
- INSERT CLEAN CARDBOARD BETWEEN CDR VALVE AND SEAL RING
- RETIGHTEN CDR FASTENERS

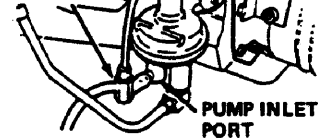


CRANKCASE PRESSURE \* TEST 14



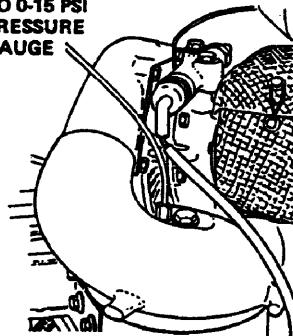
USE GUARD WHEN CHECKING TRANSFER PUMP PRESSURE TEST 12

5632 TEE TEST ADAPTER

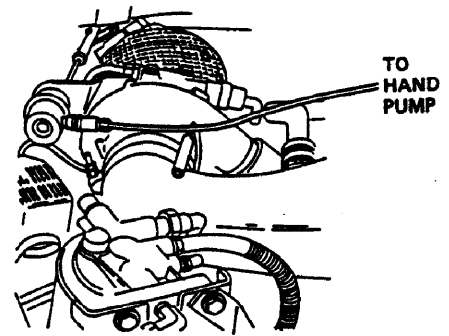


RESTRICTION AT SUPPLY PUMP INLET TEST 7D

TO 0-15 PSI PRESSURE GAUGE



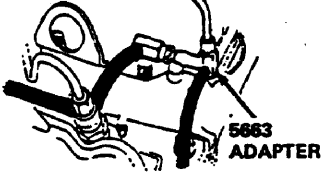
TURBOCHARGER BOOST TEST 4



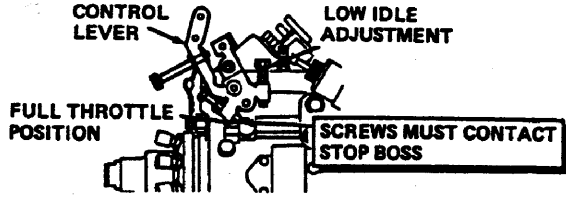
WASTEGATE ACTUATOR TEST 5



TO 0-15 PSI  
PRESSURE  
GAUGE

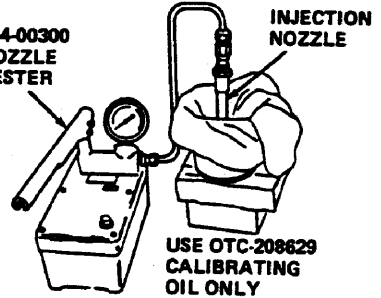


**FUEL RETURN  
LINE PRESSURE  
TEST 8**



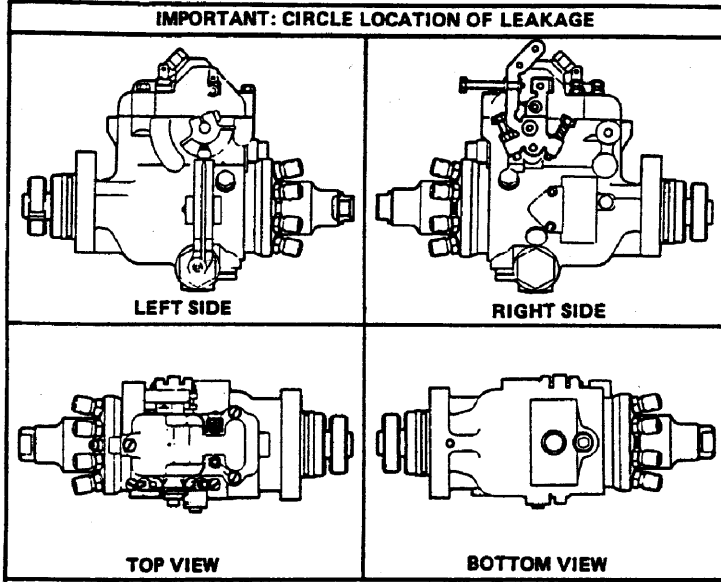
**ACCELERATOR LINKAGE  
TEST 2 AND 10**

014-00300  
NOZZLE  
TESTER



**TEST INJECTION NOZZLES  
TEST 13**

**IMPORTANT: CIRCLE LOCATION OF LEAKAGE**

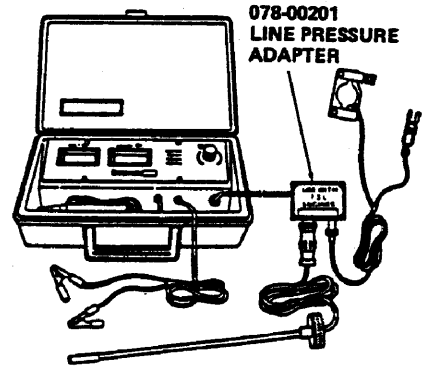


LEFT SIDE

RIGHT SIDE

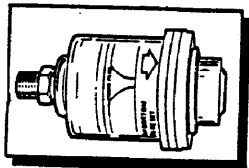
TOP VIEW

BOTTOM VIEW

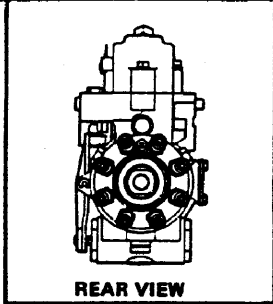


**078-00200 DYNAMIC  
TIMING METER  
TEST 11**

**EXTERNAL  
FUEL LEAKAGE  
TEST 1**

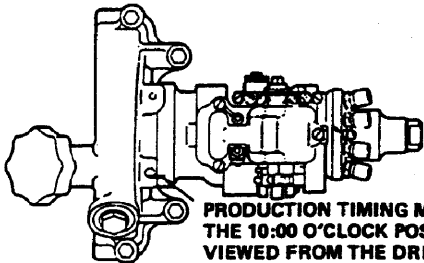
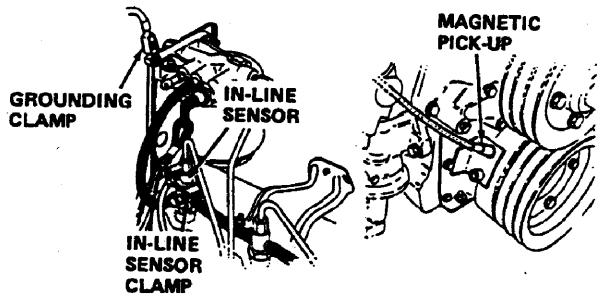


**AIR INTAKE RESTRICTION  
TEST 9**



REAR VIEW

F-SERIES SENSOR LOCATION



**PRODUCTION TIMING MARKS AT  
THE 10:00 O'CLOCK POSITION (AS  
VIEWED FROM THE DRIVER'S  
POSITION).**

**DYNAMIC TIMING MARK LOCATION  
TEST 11**

**DYNAMIC TIMING SPEC.  
8° ± 2° BTDC @ 2000 RPM**

**ENGINE TIMING SPECIFICATION  
TEST 11**