


7.3L (IDI) Diesel Engine Diagnostics Guide

 <b>7.3 IDI</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.	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 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**

<input type="checkbox"/> Oil	<input type="checkbox"/> Air Intake	<input type="checkbox"/> Water	<input type="checkbox"/> Fuel
Record Location of leaks below in Problem Found box.		Record location of the leaks on Illustration - Reverse Side	
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. 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 flapper valve in the vent fitting and a restricted fuel supply system.

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

- Flow direction OK and bubbles not present - Go to test 4B.
- 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 4A when leak is determined.
- Flow direction NOT OK - Go to test 5. Return to test 4A when leak is determined.

**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 5.
- If contamination is found - replace filter and clean or repair chassis fuel system. Go to test 5.

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

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

Measure at 3300 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 5C.
- If pressure is low - Go to 5B.

**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 5A.
- If pressure is low - Go to 5C.

**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 6.
- Pressure OK and Volume NOT OK - Go to 5D.
- Volume OK and Pressure NOT OK - replace fuel supply pump and repeat test 5A.
- Pressure and Volume NOT OK - Go to 5D.

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

Measure at 3300 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 5A.
- If vacuum is less than 6 In.-Hg. - replace fuel supply pump and repeat test 5A.

**6. 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 5A must be reconnected.

• Measure at 3300 RPM with accessories turned off. Record "Value" below.

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

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

• Measure at 3300 RPM with accessories turned off. Record "Value" below.

INSTRUMENT	GUIDELINE DATA	1st CHECK	2nd CHECK ◆
014-00761 Test Kit and 5650 Adapter	BETWEEN 2" AND 25" H2O		

- If above 25", replace filter element and retest.
- If less than 2" correct restriction in air cleaner fitting.
- If within guidelines, Go to test 8.

**\*\* 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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#### 8. \*\* 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		

#### 9. 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.

#### 10. CHECK INJECTION PUMP TRANSFER PRESSURE -- See Illustration -- Reverse Side

**NOTE: PERFORM ONLY IF 1ST TIMING CHECK (STEP 9) WAS NOT WITHIN SPEC.**  
**WARNING: THE COMPRESSOR INLET SAFETY GUARD MUST BE INSTALLED WHEN ENGINE IS RUNNING WITHOUT AIR CLEANER ATTACHED.**

- Measure at 3300 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 ● 3300 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.**

#### 11. 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.**

- A. 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.
- B. Ensure that nozzle body and tip are completely dry before starting test. Operate tester 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.

#### CHECK INJECTION LINES AND INJECTION NOZZLES CONT.

INSTRUMENT	GUIDELINE DATA		
014-00300 Injection Nozzle Tester	CODE ON NOZZLE BODY	BB or D	E
	MINIMUM OPENING PRESSURE	1425 PSI	1575
RECORD "VALUES" 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).**

#### 12. 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 intake manifold. Retighten CDR and insure dipstick is seated in tube. Remove cardboard upon completion of test.

- Measure at 3300 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.

**NOTE: Black smoke under the above conditions will be much more pronounced at higher altitudes.**

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

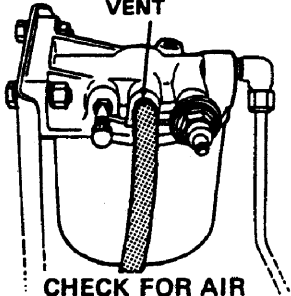
**\* SEE REVERSE SIDE FOR TEST HARDWARE INSTALLATION \*\* ENGINE MUST BE AT NORMAL OPERATING TEMPERATURE**  
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What problems were found and what repairs were performed?

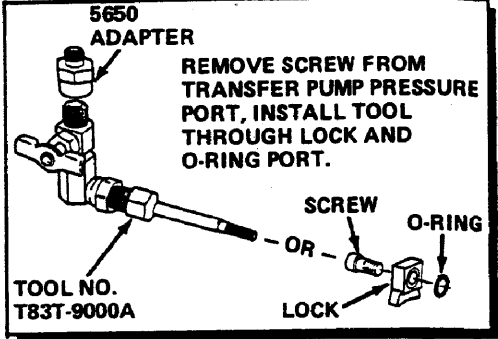
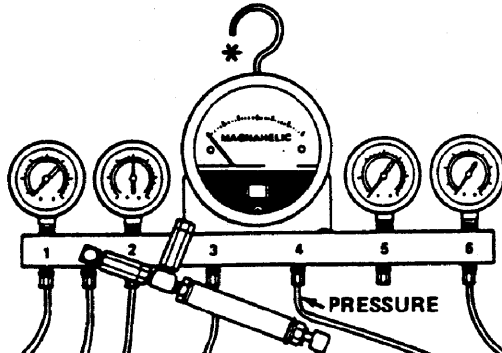
List Part Name, Number and Serial Number of parts replaced.

# 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 4A



REMOVE SCREW FROM TRANSFER PUMP PRESSURE PORT, INSTALL TOOL THROUGH LOCK AND O-RING PORT.

TOOL NO. T83T-9000A

SCREW  
O-RING  
LOCK

TO CHASSIS FUEL SYSTEM

5651 ADAPTER

PLUG

LEAK-OFF HOSE REMOVED

CHECK FUEL FILTER OUTLET PRESSURE TEST 5A

REMOVE FUEL PRIMING VENT



SUPPLY PUMP OUTLET PRESSURE & CAPACITY TEST 5B & C

3019 ADAPTER

5632 TEE TEST ADAPTER

PUMP INLET PORT

RESTRICTION AT SUPPLY PUMP INLET TEST 5D

PRODUCTION

REWORKED

TO CORRECT RESTRICTION IN AIR CLEANER FITTING, REMOVE AIR CLEANER LID AND DRILL 1/32" HOLE IN SINTERED SCREEN. REINSTALL PLASTIC CAP ON AIR CLEANER FITTING AFTER TEST.

5650 ADAPTER

SINGLE ELEMENT AIR CLEANER  
AIR CLEANER \* RESTRICTION TEST 7

5631 ADAPTER

014-00743 ADAPTER

CRANKCASE PRESSURE \* TEST 12

TO 0-15 PSI PRESSURE GAUGE

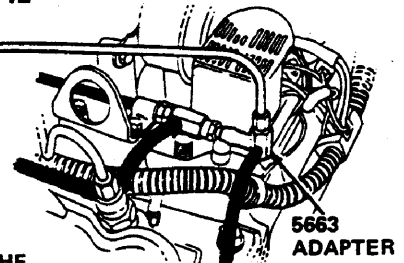
FORD TOOL T83T-9000A

INJECTION PUMP FUEL TRANSFER PRESSURE TEST 10

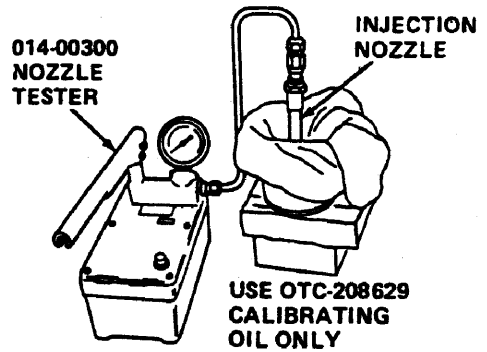
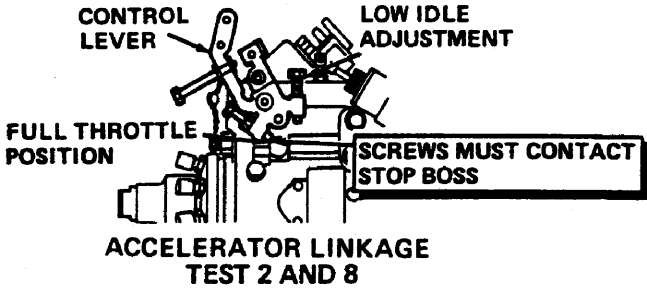
\*LOOSEN CDR FASTENERS  
\*INSERT CLEAN CARDBOARD BETWEEN CDR SEAL RING AND INTAKE MANIFOLD  
\*RETIGHTEN CDR FASTENERS



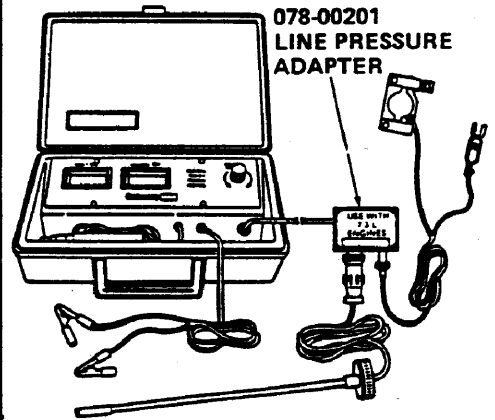
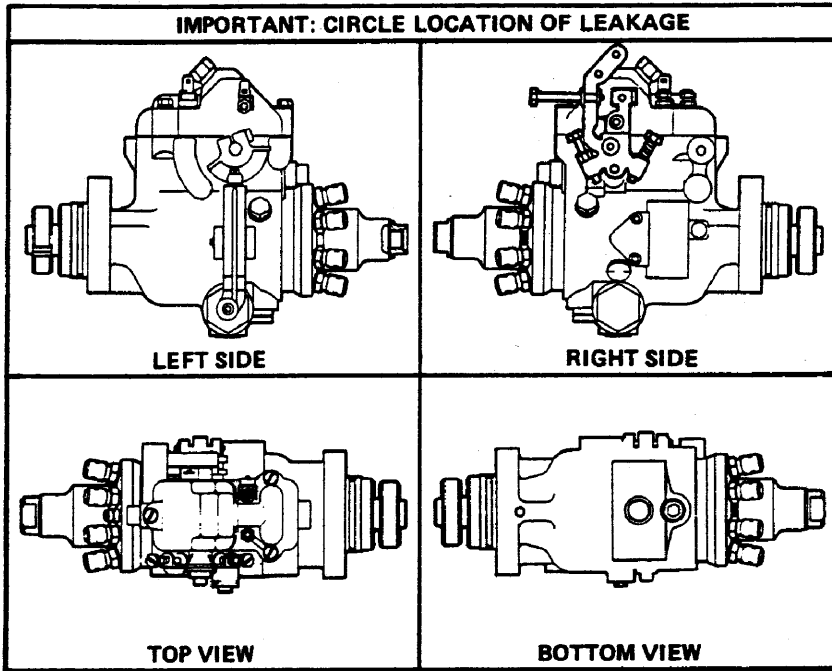
\*NOTE:  
DO NOT CONNECT BOTH PORTS OF THE MAGNEHELIC GAUGE AT ONCE. WHEN TAKING A READING (VACUUM OR PRESSURE) LEAVE THE OTHER PORT OPEN TO ATMOSPHERE.



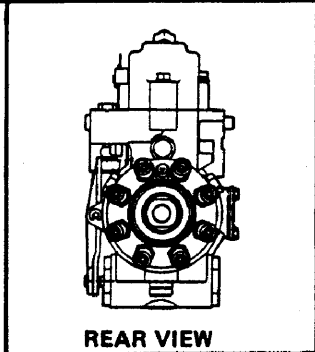
FUEL RETURN LINE PRESSURE TEST 6



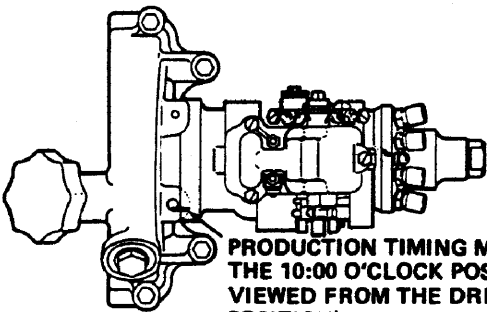
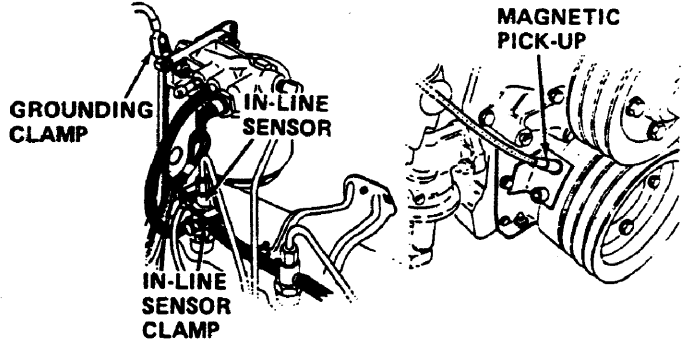
TEST INJECTION NOZZLES TEST 11



EXTERNAL FUEL LEAKAGE TEST 1



F-SERIES SENSOR LOCATION



DYNAMIC TIMING MARK LOCATION TEST 9

DYNAMIC TIMING SPEC.

$8^{\circ} \pm 2^{\circ}$  BTDC @ 2000 RPM

ENGINE TIMING SPECIFICATION TEST 10