SECTION 26

Driveability Intermittents

Contents

Intermittent Fault Diagnosis

WHEN TO USE INTERMITTENT FAULT DIAGNOSIS

It is recommended, that before using this Section for the first time, you view the video program that explains the steps used in this Section. The video program is available in laser disc for viewing in the dealership and a VHS format for home video recorders.

INTERMITTENT FAULT DIAGNOSIS DESCRIPTION

Intermittent fault diagnosis provides a technique that you can use to find an intermittent fault. **A vehicle is diagnosed with an intermittent fault when:**

- **The vehicle has been returned to the dealership with a fault that cannot be duplicated by the technician under normal driving conditions.**

Prior to starting these procedures, the technician **must** have checked out all mechanical systems according to Section 2 of the manual.

Before beginning, the Service Writer should contact the customer and complete the "Customer Contact Sheet." These questions may help you in duplicating the problem, which in turn will allow you to correct the concern.

NOTE: The following procedures for finding intermittent faults DO NOT provide exact answers to problems. They provide a technique that has been proven to correct intermittent faults. At times, it may be necessary to use your own judgement when diagnosing an intermittent fault.

Intermittent Fault Diagnosis — Customer Contact Sheet Instructions

NOTE TO THE SERVICE WRITER:

Circle the answers obtained when asking the following questions of the DRIVER of the vehicle. If at all possible, talk to the person or persons who where driving the vehicle when the problem occurred. This may not be the person who brought the vehicle in for service.

NOTE: The terms cold, warm and hot are used in the following questions. An engine is considered cold up until two minutes after starting the engine. A warm condition is from two to four minutes after starting the vehicle. A hot condition is present after the upper radiator hose is hot and pressurized. If the start-up occurs under adverse temperature conditions such as below zero or above 100 degrees Fahrenheit you will have to take this into consideration.

Ask the driver the following questions:

1. What exactly is the problem?
2. What happens to the vehicle when the problem occurs?
3. When was the last time the vehicle showed this driveability problem?
   - Was this while the vehicle was moving, and most often:

     During braking?

     During a change from acceleration to a coast condition?

     When turning? If yes, at what speed?

     When driving over rough roads?

     When accelerating?

     When driving at any speed?

     In a certain gear range?

     When the heater or air conditioner was turned on?

     When turning the steering wheel to a full stop?

     When the clutch was depressed? When the clutch was let up?

     Was this during any of the following drive conditions:

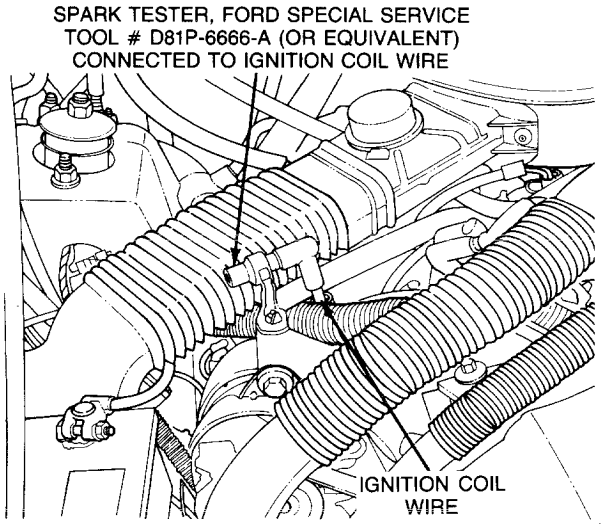
     — cold engine **start-up, idle, driveaway, cruise, acceleration, deceleration**?

     — warm engine **start-up, idle, driveaway, cruise, acceleration, deceleration**?

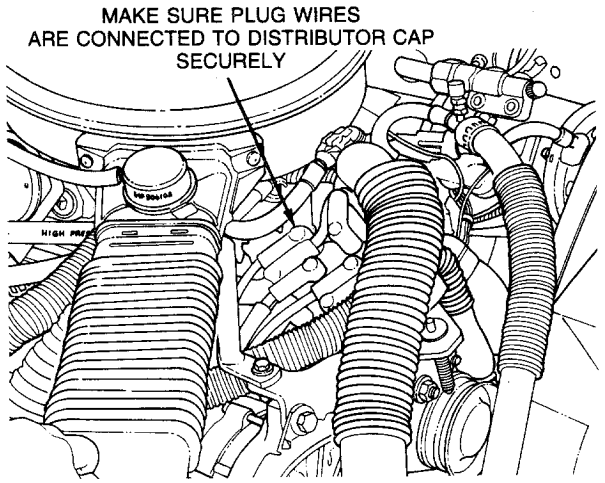
     — hot engine **start-up, idle, driveaway, cruise, acceleration, deceleration**?
4. Does the problem vary with vehicle speed?
5. Does the problem vary with engine speed?
6. Does the problem happen only when starting the vehicle?
7. Do you remember what the driving conditions were when the problem occurred the time before the last time?
   - If yes, were the conditions the same as stated above for the latest problem?
8. When the problem occurs, does the vehicle or engine make a noise?
   - If yes, please describe the noise.
9. Has the vehicle been worked on, for this problem, by anyone else?
   - If yes, who?
10. Do you purchase your fuel at the same station at all times?
11. If not, does the problem occur when you purchase your fuel at a certain station?
12. Do you purchase the same grade of fuel (octane level) at all times?
13. Does the problem occur when you purchase a different grade (octane level) of gasoline?
14. Is there anything else that might help us in locating the problem?

Intermittent No Start And Quits On Road With No Restart

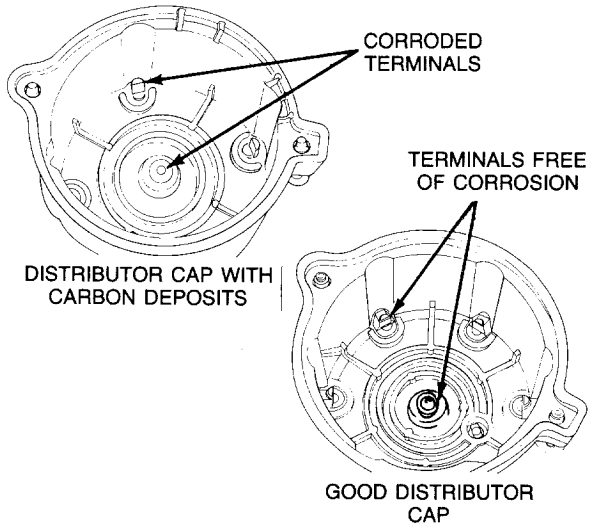
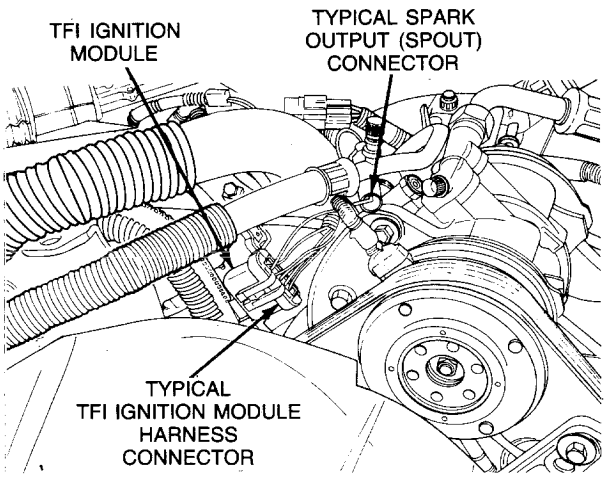
STEPS	POSSIBLE ACTION TO TAKE
• Review the repair order. **If required, contact the driver or drivers of the vehicle to get further information. Refer to the Customer Contact Sheet on page 2 of this Section.**	• If repair order shows any pattern (e.g., no-start occurs whenever the engine is warm or cold), duplicate the same condition and try to start the vehicle.
• Visually inspect the engine compartment. **DO NOT disturb anything.**	• If you determine by a visual inspection that anything is disconnected, **do not reconnect the item. If you move any component or connection, you could make it harder to repeat the intermittent problem. NOTE: Look for areas where electrical wires or vacuum lines could be cut by sharp edges or burned by engine hot spots. Blocked or kinked vacuum lines can also cause trouble.**
• Try to start the vehicle.	• If vehicle does not start, perform routines according to Volume H.
• If vehicle starts, take it for a test drive for "Quits on Road with no Restart" condition. **Take along the spark tester.**	• If vehicle quits on road and can't be restarted, listen for the sound of the fuel pump operating when the ignition key is turned On and check for spark at the coil. Then check TSBs for this concern when you get back to the shop if applicable.



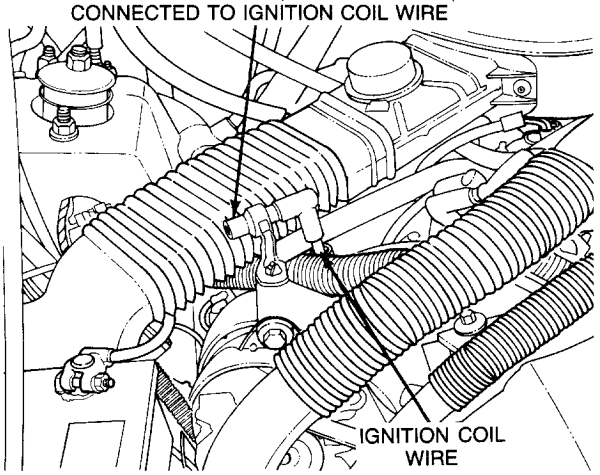
Intermittent No Start And Quits On Road With No Restart

STEPS	POSSIBLE ACTION TO TAKE
• If you cannot verify the concern, contact the driver of the vehicle for additional information.	• If the driver leads you to another vehicle system, work on that system. If not, continue to the next step.
• Check the ignition system secondary wires for damage or loose connections.	• If ignition system secondary wires are **not** damaged or loose, continue to the next step. • If secondary wires are damaged, replace them and try to start the vehicle. • If secondary wires are loose, repair as necessary and try to start the vehicle. 

Intermittent No Start And Quits On Road With No Restart

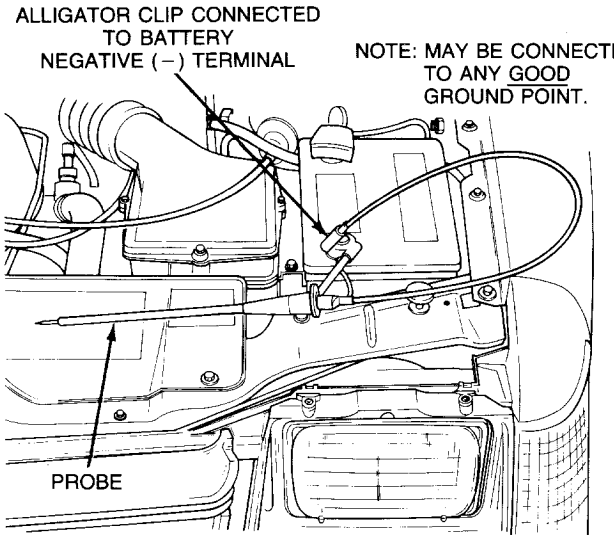
STEPS	POSSIBLE ACTION TO TAKE
• Check distributor cap for moisture, cracks, or salt-like deposits.  	• If distributor cap has moisture, find out why. If necessary, replace the cap. • If distributor cap has cracks or salt-like deposits, replace the cap with a new one. • Check the rotor for damage or burns. • If rotor is damaged or burned, replace with a new one, and try to start the vehicle.
• Check the TFI ignition module for damage or loose connections. **NOTE: Do not use the TFI ignition module as a fulcrum for turning the distributor.**  	• Replace the TFI ignition module if damaged.
• Check the TFI ignition module six-pin connector to ensure it is installed correctly and that the gasket is not folded over.	• Repair any loose connections. Reinstall connector if not properly installed.

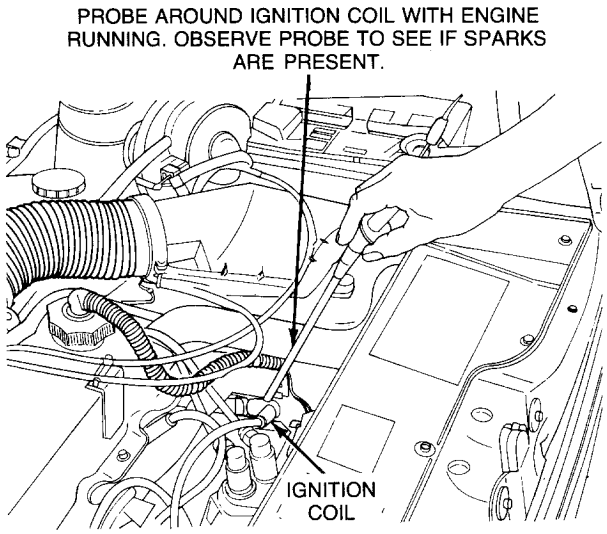
Intermittent No Start And Quits On Road With No Restart

STEPS	POSSIBLE ACTION TO TAKE
• Install a spark tester to the ignition system coil wire. **NOTE: Disconnect the wire at the distributor.** Crank the engine. • Verify that a good, strong blue spark is observed while the engine is cranking. This indicates that the coil and primary circuit are OK. • **NOTE: By connecting the spark tester to the coil wire, you are able to verify that the coil is firing on each PIP signal.** **NOTE: Never allow the spark from the coil wire to go directly to ground. This could cause internal damage to the coil.** SPARK TESTER, FORD SPECIAL SERVICE TOOL # D81P-6666-A (OR EQUIVALENT) CONNECTED TO IGNITION COIL WIRE  	• If a good, strong blue spark is not detected, repair according to ignition procedures located in Section 15 of Volume H. • If an intermittent spark is present, the ignition coil may be damaged internally.
• With the spark tester still connected to the coil wire, wiggle the ignition primary connectors while cranking the engine. • **NOTE: By performing this test while cranking, we check those circuits dedicated to the start mode.**	• If an intermittent loss of spark is detected, there could be an intermittent open in the TFI ignition module connector or harness that could cause an intermittent no-start. • **NOTE: An intermittent open in the TFI ignition module or harness could cause a no-start by preventing the TFI ignition module from firing the coil.** • **NOTE: An intermittent open in the coil primary harness or connecter could cause a no-start because the coil is not receiving battery voltage.**

Intermittent No Start And Quits On Road With No Restart

STEPS	POSSIBLE ACTION TO TAKE
• **NOTE: For the following test the engine MUST be running.** Use a jumper wire with an alligator clip at both ends. Attach one of the clips to a **good** ground location. Attach the other end to the metal part of a screwdriver. While the engine is running, pass the screwdriver around the base of the coil. **WARNING: USE CAUTION NOT TO GET THE SCREWDRIVER OR WIRE ENTANGLED WITH THE DRIVE BELTS OF THE VEHICLE.**	• Arcing indicates a breakdown in the insulation of the coil or coil wire.



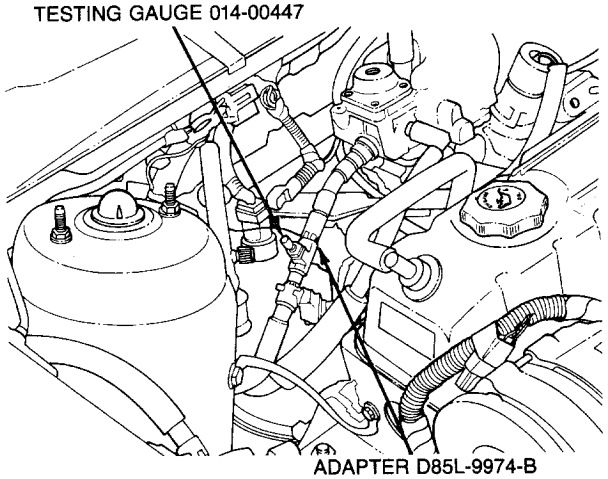


• If the vehicle is running, turn it Off. From inside the vehicle, using the ignition switch, "**bump/crank**" the engine approximately ten times.	• If the engine fails to start on any of the tries, the ignition switch may be damaged internally.
• Connect a fuel pressure gauge to the engine with an extension hose long enough to allow the gauge to reach the windshield, as outlined in Group 24 of the Shop Manual. **NOTE: A suitable hose was issued in the 1985 Ford Tool Package.** **NOTE: For 2.3L and 2.5L HSC engines, and other applications without a Schrader valve installed in the fuel system, use Rotunda Tool D85L-9974-B, In-Line Pressure Tester Adapter.**	• If the pressure **does not** increase each time the key is turned to On, there is a problem in the fuel system. • Check the inertia switch, the fuel pump relay wiring connectors, and the fuel pump ground connection for looseness, corrosion, or other factors that could cause an intermittent open circuit. **NOTE: On certain vehicles the fuel pump ground is located beside the driver's seat, under the carpet. Refer to past TSBs for fuel pump ground locations.**

Intermittent No Start And Quits On Road With No Restart

STEPS	POSSIBLE ACTION TO TAKE

FUEL PRESSURE VALVE TO ROTUNDA FUEL PRESSURE TESTING GAUGE 014-00447

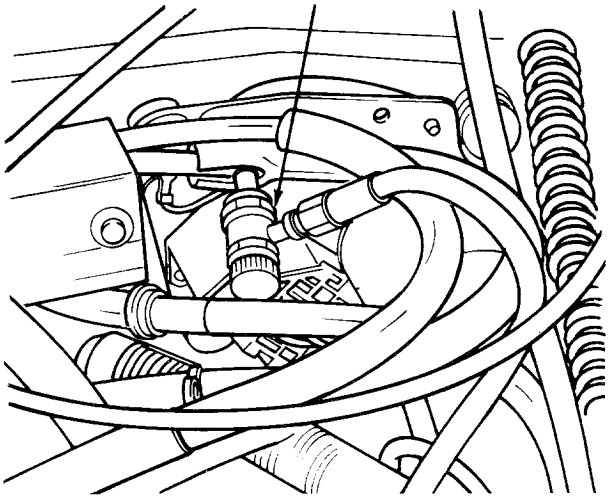
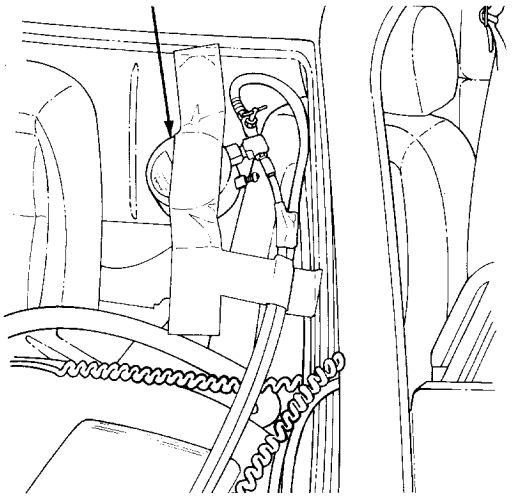


ADAPTER D85L-9974-B CONNECTED IN LINE BETWEEN LOW-PRESSURE FUEL INJECTION CHARGING ASSEMBLY AND FUEL LINE

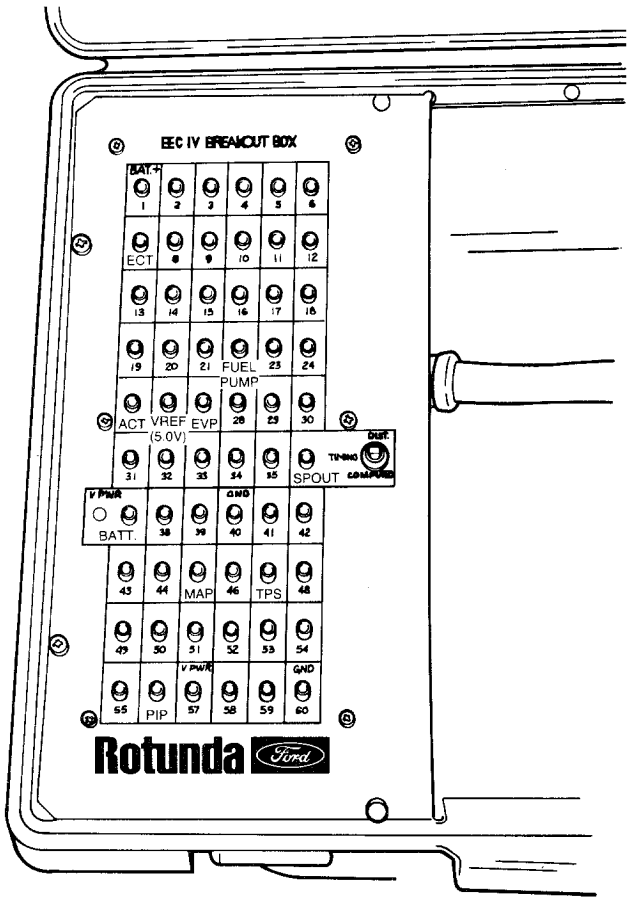
- Tape the pressure gauge to the windshield. This allows you to read the fuel pressure from the inside of the vehicle. **NOTE: Do not tape the pressure gauge where it will interfere with the windshield wiper blades or linkage.**
- Turn the ignition key to the ON position for two seconds, watch the fuel gauge for a pressure increase. Repeat the procedure ten times. There should be a pressure increase each time the key is turned On.

  NOTE: On engines equipped with a 10 second delay power relay, pause 10 seconds between turning the key Off and On.

Intermittent No Start And Quits On Road With No Restart

STEPS	POSSIBLE ACTION TO TAKE
ROTUNDA FUEL PRESSURE TESTING GAUGE 014-00447 — TYPICAL HOOK-UP TO FUEL PRESSURE VALVE 	ROTUNDA FUEL PRESSURE TESTING GAUGE 014-00447 — TYPICAL HOOK-UP SHOWING GAUGE TAPED TO OUTSIDE OF WINDSHIELD 
• If the fuel and ignition systems are OK, check the spark plugs for soot or fuel fouling.	• If spark plugs are fouled, clean or replace as required.
• **If the intermittent fault is still present, refer to Section 2.**	• **If after referring to Section 2 and running the Quick Test according to procedures found in this book, the fault is not found, continue to the next step.**
NOTE: Do not continue to the next step unless the Quick Test has been performed according to procedures outlined in this book, and the intermittent fault has NOT been found.	
• If the Quick Test did not find the cause of the intermittent fault, prepare the vehicle for another road test. • Verify that the fuel pressure gauge is still attached securely to the windshield. Hook up the Black STAR tester and connect the breakout box. • Label the following key points on the breakout box: — battery voltage — reference voltage — throttle position sensor — PIP signal — ECT sensor — ACT sensor — SPOUT signal — fuel pump (circuit at ECA)	• Make a copy of the five-column chart located at the end of this section and record the readings taken with the ignition key in the ON position and also while the engine was cranking, and stabilized at idle. • These are "baseline" readings of key voltages while the engine is operating properly. By comparing these baseline readings with the readings when the intermittent symptom occurs, it is possible to isolate the component or circuit that is at fault.

Intermittent No Start And Quits On Road With No Restart

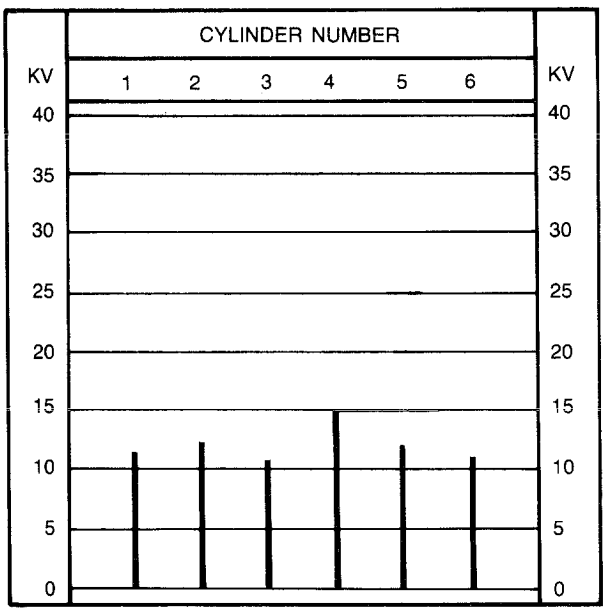
STEPS	POSSIBLE ACTION TO TAKE
ROTUNDA EEC-IV 60-PIN BREAKOUT BOX 014-00322 — WITH KEY PINS LABELED  • **NOTE: Refer to the correct vehicle "Engine Supplement" Section for the correct pin numbers for the points listed.** • Disconnect the coil primary connector so the engine will not start. Turn the ignition key to the ON position and check key points with a DVOM. **DO NOT CRANK THE ENGINE AT THIS TIME.** • Repeat the procedure while cranking the engine. • Repeat the procedure at stabilized idle.	
• After recording the baseline readings, keep the ignition key in the ON position and perform a Key On/Engine Off Quick Test.	• When the Key On/Engine Off Quick Test is completed and everything has checked out properly, unlatch the STAR tester.

Intermittent No Start And Quits On Road With No Restart

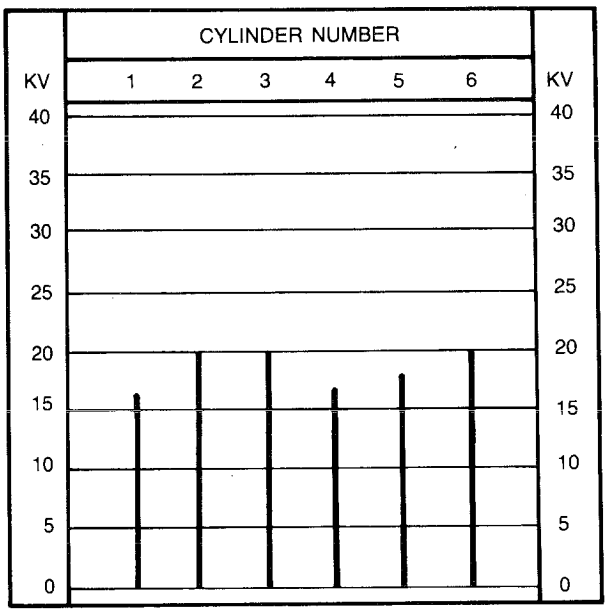
STEPS	POSSIBLE ACTION TO TAKE
• Start the vehicle, and enter the "wiggle test" mode.	• If the STAR tester detects a fault in wiggle test mode during the test drive, it will beep, and the code can be retrieved from memory.
• On the following test drive, take along the spark tester, DVOM and Volume H. • Begin vehicle test drive. At first half of the test drive, note the fuel pressure gauge reading. • **NOTE: Before starting the test drive, make sure the line to the fuel pressure gauge and the test equipment wires are properly connected and routed to avoid pinching or crimping.**	• If there is a decrease in the fuel pressure, there may be a blockage in the fuel filter, a kinked fuel line, or insufficient voltage to the fuel pump. • Information received from the driver may now help you to narrow down the problem. • If the engine quits during the test drive, carefully coast to the side of the road, **but do not move the ignition key from the ON position.**
• Now recheck the key points using the breakout box and DVOM.	• If the readings are different, check the circuit to locate the problem, and repair or replace as required. • If the readings are close to the baseline readings, continue to the next step.
• Latch the STAR tester and perform the Key On/ Engine Off and Engine Running Quick Tests.	• If the Quick Test steps detect a problem in the circuit, repair or replace as required. • If the Quick Test steps do not detect a problem in the circuits, continue to the next step.
• Check for spark. If no spark is detected, disconnect the SPOUT signal connector, and again check for spark.	• If spark is restored, go to the no-start Pinpoint Test in Volume H. • If spark does not appear, continue to the next step.
• Check for a PIP signal while cranking the engine.	• When the PIP signal is detected, check the TFI and E-core coil circuits for continuity using the DVOM. • If there is no PIP signal, **do not** assume that there is something wrong with the PIP sensor. Check the crank, run, and ground circuits at the TFI connector first.

Intermittent Surging At A Steady Speed

STEPS	POSSIBLE ACTION TO TAKE
• Review the repair order. **If required, contact the driver or drivers of the vehicle to get further information. Refer to the Customer Contact Sheet on page 2 of this Section.**	• If repair order shows any pattern (e.g., surge at steady speed occurs whenever the engine is warm or cold), try to duplicate the same condition.
• Visually inspect the engine compartment. **DO NOT disturb anything.**	• If you determine by a visual inspection that anything is disconnected, **do not reconnect the item. If you move any component or connection, you could make it harder to repeat the intermittent problem. NOTE: Look for areas where electrical wires or vacuum lines could be cut by sharp edges or burned by engine hot spots. Blocked or kinked vacuum lines can also cause trouble.**
• Take the vehicle for a test drive to try to verify the concern.	• If the concern is repeatable, check for any TSBs that might apply to this concern.
• If the concern is not repeatable, get more information; what speed is the intermittent surge at? Are there any certain conditions when the surge always happens?	• If the driver gives you information that might help in diagnosing the problem, take the vehicle on another test drive to try to duplicate the problem. • If the driver does not give you any more information, continue to the next step.
• Connect an engine analyzer to the vehicle. • Check plug firing voltages, cylinder balance, and base timing.	• If the engine analyzer shows a problem, repair or replace as required.

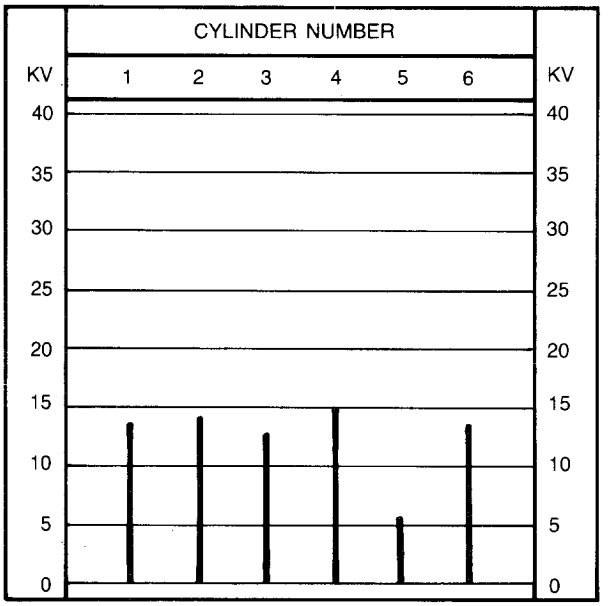


ENGINE ANALYZER DISPLAYS — PROPERLY OPERATING IGNITION SYSTEM

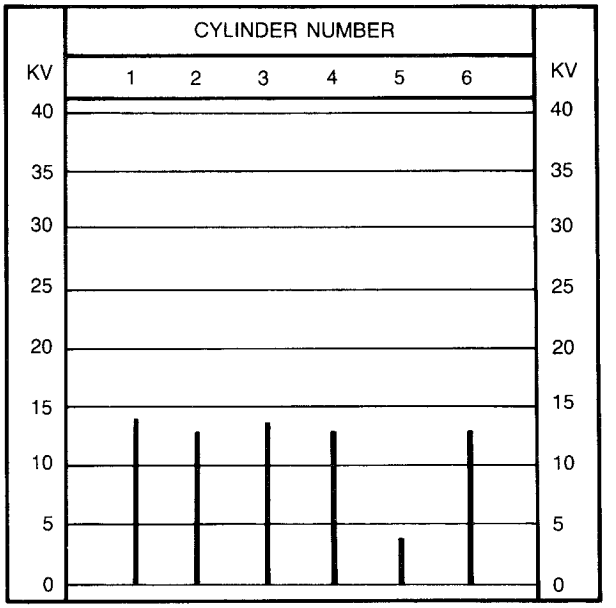


ENGINE ANALYZER DISPLAYS — AVERAGE PLUG FIRING VOLTAGE GREATER THAN 15KV

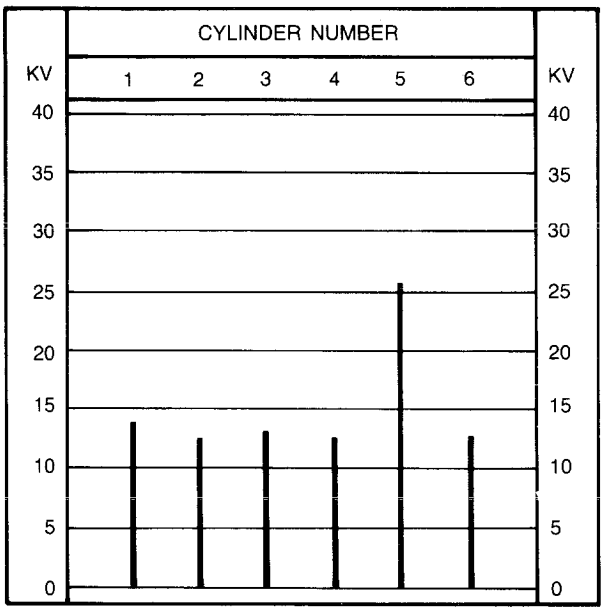
Intermittent Surging At A Steady Speed



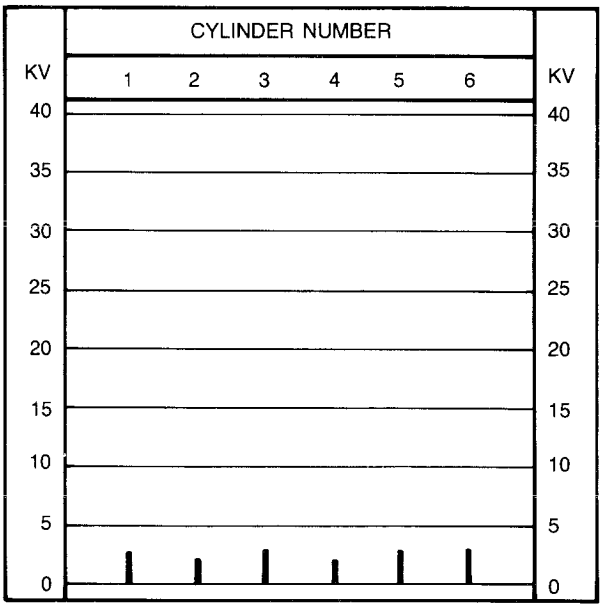
ENGINE ANALYZER DISPLAYS — PLUG FIRING VOLTAGE VARIATION GREATER THAN 5 KV



ENGINE ANALYZER DISPLAYS — LOW PLUG FIRING VOLTAGE IN ONE CYLINDER



ENGINE ANALYZER DISPLAYS — HIGH PLUG FIRING VOLTAGE IN ONE CYLINDER



ENGINE ANALYZER DISPLAYS — NEGATIVE FIRING VOLTAGE

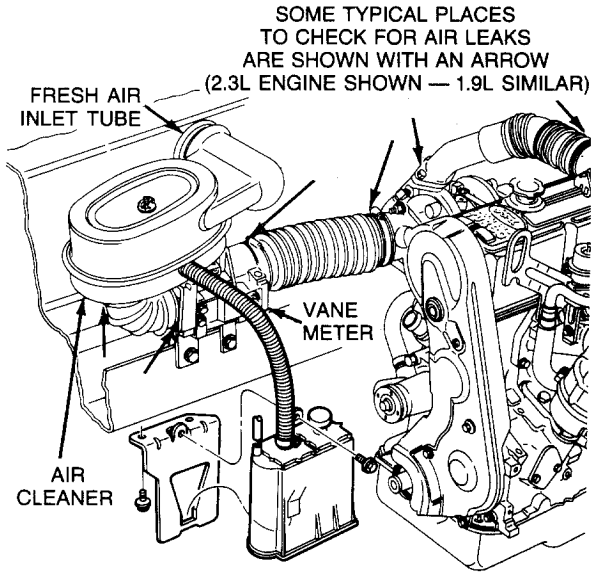
Intermittent Surging At A Steady Speed

STEPS	POSSIBLE ACTION TO TAKE
• When all tests have been performed on the engine analyzer, check the spark plugs for ash fouling, proper gap, and to make sure they are the right type of plug for the engine.	• If the spark plugs are fouled, clean or replace as required. If the spark plugs have an improper gap, regap and install. If the spark plugs are not the correct type, replace with the correct type of plugs. • If the spark plugs check out OK, continue to the next step.
• **If the intermittent fault is still present, refer to Section 2.**	• **If after referring to Section 2 and running the Quick Test according to procedures found in this book, the fault is not found, continue to the next step.**

NOTE: Do not continue to the next step unless the Quick Test has been performed according to procedures outlined in this book, and the intermittent fault has NOT been found.

• Connect a MAP/BP tester to either the manifold absolute pressure (MAP) or barometric pressure (BP) sensor (depending on how vehicle is equipped) and check the readings with the engine Off and the ignition key in the ON position. • Compare the reading to the correct value listed on page 50 of this supplement. • If the vehicle is equipped with a MAP sensor, repeat the MAP test with the engine running. The MAP tester reading should decrease at idle and increase when you bump the throttle. **NOTE: If the vehicle is equipped with a barometric pressure (BP) sensor, the engine running portion of the test does not have to be performed since there is no vacuum hookup to the engine.**	• On a vehicle equipped with a MAP sensor, if the reading obtained with the engine OFF and ignition key ON does not match the value given in the Pinpoint Test, perform the appropriate Pinpoint Test in Volume H. • If the MAP sensor does not change when you bump the throttle with the engine running, substitute a known good hose for the original MAP sensor vacuum hose connected to the sensor and repeat the test. A change in the MAP tester reading indicates that the original hose was damaged, blocked or kinked. • On a vehicle equipped with either a MAP or BP sensor, substitute with a known good component and retest. If readings are now OK, replace the component.

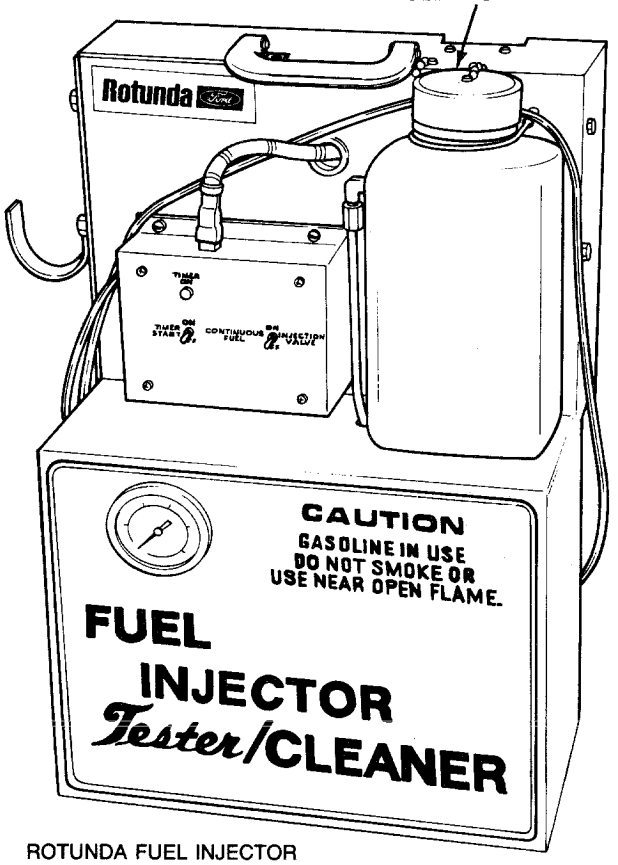
Intermittent Surging At A Steady Speed

STEPS	POSSIBLE ACTION TO TAKE
• If the vehicle is equipped with a vane meter, **carefully** check for unmetered air leaks (i.e., loose air tubes, missing hoses or vacuum caps, etc.)  	• Correct air or vacuum leaks as necessary.
• With breakout box installed monitor vane meter signal while you manually move the vane meter door through its entire range.	• Voltage must increase smoothly as door is opened.
• Connect a Rotunda Fuel Injector Tester/Cleaner to the vehicle according to instructions that come with the unit. • Check the flow of the injectors against the specifications given with the Tester/Cleaner and the injector chart.	• If injector flow is not up to specifications, clean the injectors. Follow the instructions that come with the Tester/Cleaner.

Intermittent Surging At A Steady Speed

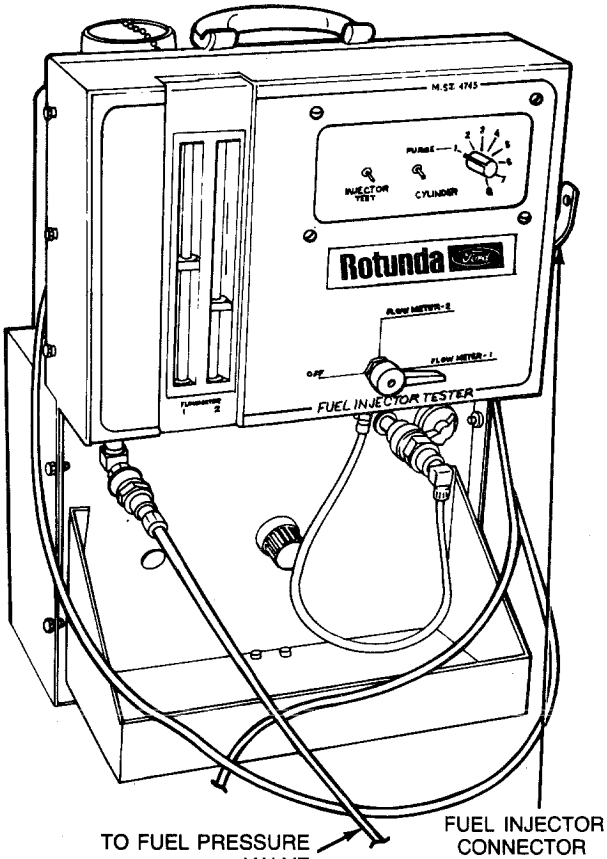
STEPS	POSSIBLE ACTION TO TAKE

TESTER/CLEANER
FUEL RESERVOIR



ROTUNDA FUEL INJECTOR
TESTER/CLEANER 113-00001

ROTUNDA FUEL INJECTOR TESTER/CLEANER
113-00001 — TYPICAL HOOK-UP TO FUEL INJECTORS
AND FUEL PRESSURE VALVE



TO FUEL PRESSURE
VALVE

FUEL INJECTOR
CONNECTOR
LEADS

Intermittent Surging At A Steady Speed

The following charts list fuel injector applications, part numbers, source, color code and injector specifications.

HIGH PRESSURE CFI INJECTOR APPLICATION

ENGINE APPLICATION	MODEL YEAR	PART NO. - 9F593 -	SOURCE	COLOR CODE	INJECTOR SPECS.	
					SIZE	RESIST
					gm/sec	Ohms
1.6L	1983	E3EE-BA	Bosch	Blue	1.76 (14#/HR)	2.25
	1984	E4EE-AA	N.D.	Blue		2.35
1.6L T/C	1984-85	E4EX-AA	Bosch	Black	3.00 (23#/HR)	2.40
1.9L	1985-1/2-86	E6EE-AB	Bosch	White	2.45 (19#/HR)	2.25
2.3L T/C	1983	E3ZE-BA	Bosch	Green	3.86 (30#/HR)	2.40
	1984	E4ZE-AA	D.K.K.			2.35
	1985	E5ZE-AA	D.K.K.	Brown	4.41 (35#/HR)	2.35
	1986	E5ZE-AB	D.K.K.			
2.3L (Truck)	1985	E59E-AA	N.D.	Gray	1.76 (14#/HR)	16.20
	1986	E59E-AB	N.D.			
2.9L (Car/Truck)	1986	E67C-A1B	Bosch	Gray	1.76 (14#/HR)	14.50
3.0L (Car/Truck)	1986	E59E-AB	N.D.	Gray	1.76 (14#/HR)	16.20
		E67E-BB	Bosch			14.50
3.8 CFI	1984-86	E3VE-A1A	Bosch	Green	4.54 (37#/HR)	2.25
		-A2A	N.D.			2.00
5.0L CFI	1980	EOSE-AA	Bosch	Blue	5.81 (46#/HR)	2.40
	1983	EOSE-A1A	Bosch			2.40
		EOSE-A2A	N.D.			2.00
	1984	EOSE-A1A	Bosch			2.25
		EOSE-A2A	N.D.			2.00
5.0L H.O. CFI	1984-85	E4ZE-CA	Bosch	Gray	6.60 (52#/HR)	2.25
5.0L SEFI	1986	E59E-AB	N.D.	Gray	1.76 (14#/HR)	16.20
		E67E-BB	Bosch			14.50
5.0L H.O. SEFI	1986	E6TE-AB	N.D.	Gold	2.45 (19#/HR)	16.20
5.0L Truck	1985	E5TE-AA	Bosch	Gold	2.45 (19#/HR)	15.50
		E5TE-AA	N.D.			16.20
		E5TE-AA	D.K.K.			16.20
	1986	E5TE-AB	D.K.K.			16.20
		E5TE-BB	Bosch			14.50

LOW PRESSURE CFI INJECTOR APPLICATIONS

2.3L HSC	1985-86	E43E-AC	Bosch	Blue	7.00 (56#/HR)	1.40
2.3L H.O. HSC (Manual Trans. Only)	1985	E53E-AB	Bosch	Green	8.00 (64#/HR)	1.40
2.5L HSC	1986	E53E-AB	Bosch	Green	8.00 (64#/HR)	1.40

Intermittent Surging At A Steady Speed

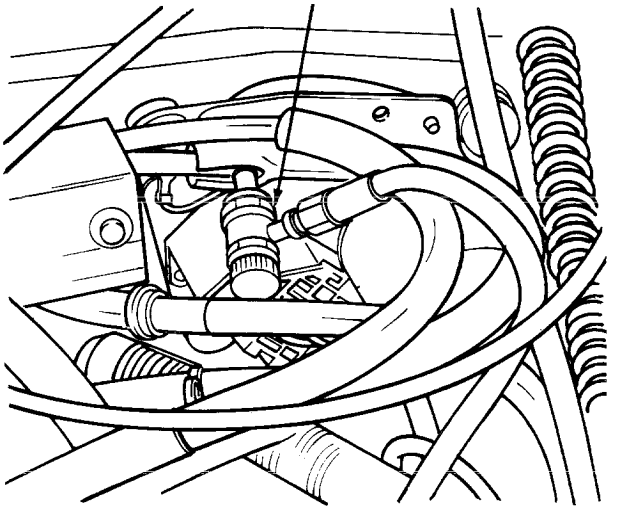
STEPS	POSSIBLE ACTION TO TAKE
• After cleaning the injectors, test the injector flow again.	• If the injectors still do not meet specifications, replace them.
• If the problem still exists, and you have not done so yet, check the OASIS system and related TSBs.	• If TSBs or OASIS do not take you in a direction toward fixing the problem, continue to the next step.

NOTE: For 2.3L and 2.5L HSC engines, and other applications without a Schrader Valve installed in the fuel systems, use Rotunda Tool D85L-9974B, In-Line Pressure Tester Adapter.

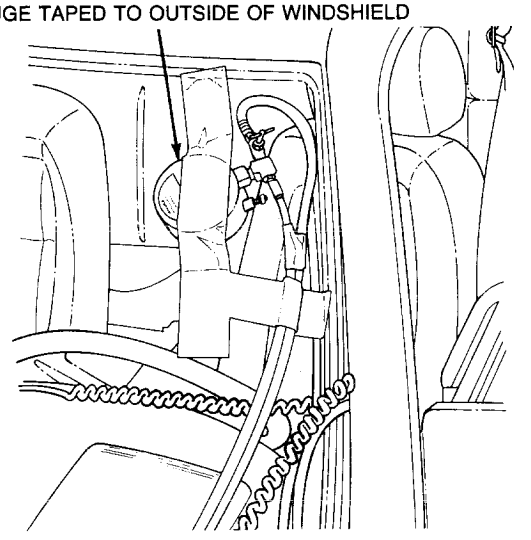
- Install a fuel pressure gauge with an extension hose, so that the fuel pressure can be monitored during the test drive. (Tape the fuel pressure gauge to the windshield for easy viewing.)

- Make a copy of the five-column chart at the end of this section and record the readings on the breakout box, vacuum gauge and fuel pressure gauge taken with the ignition key in the ON position while the engine was cranking.
- These are "baseline" readings of key voltages, vacuum condition and fuel pressure while the engine is operating properly. By comparing these baseline readings with the readings when the intermittent symptom occurs, it is possible to isolate the component or circuit that is at fault.

ROTUNDA FUEL PRESSURE TESTING GAUGE 014-00447 — TYPICAL HOOK-UP TO FUEL PRESSURE VALVE

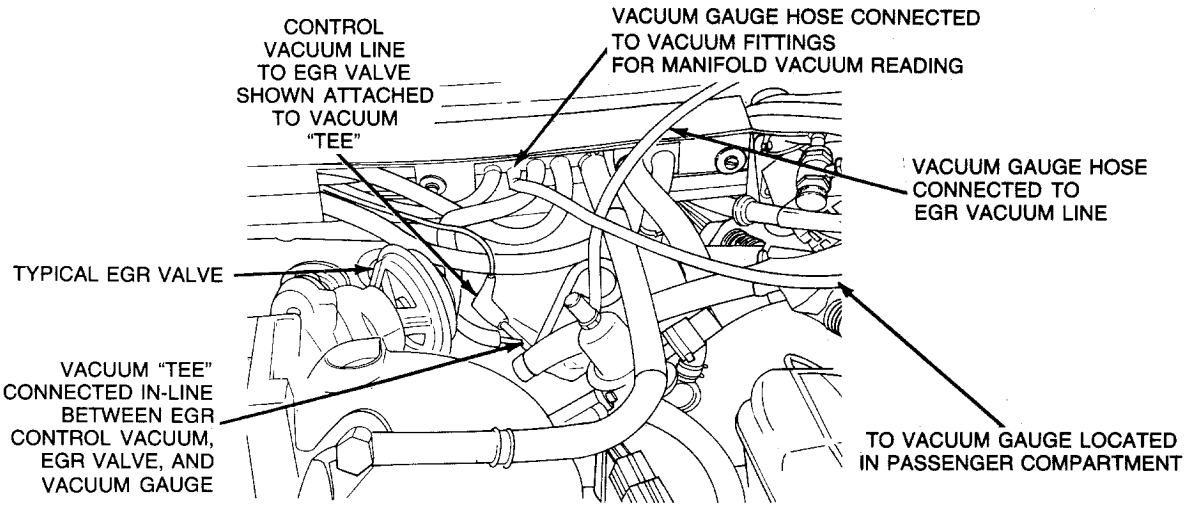


ROTUNDA FUEL PRESSURE TESTING GAUGE 014-00447 — TYPICAL HOOK-UP SHOWING GAUGE TAPED TO OUTSIDE OF WINDSHIELD



Intermittent Surging At A Steady Speed

STEPS	POSSIBLE ACTION TO TAKE
• "Tee" a vacuum gauge and extension hose into the EGR valve vacuum line (use a 0-to-100 inches of water vacuum gauge). Install a black STAR tester. Route the STAR tester and vacuum gauge inside the vehicle so you can read them.	

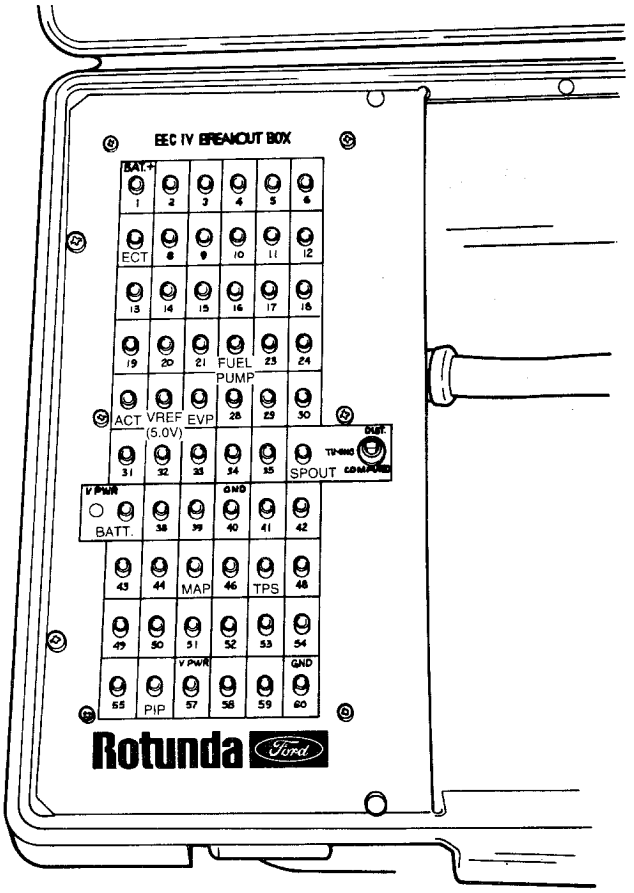


• Hook up the breakout box with the following key points labeled on the breakout box: — battery voltage — reference voltage — throttle position sensor — PIP signal — ECT sensor — ACT sensor — SPOUT signal — fuel pump (circuit at ECA)	

Intermittent Surging At A Steady Speed

STEPS	POSSIBLE ACTION TO TAKE

ROTUNDA EEC-IV 60-PIN BREAKOUT BOX 014-00322 — WITH KEY PINS LABELED



- **NOTE: Refer to the correct vehicle "Engine Supplement" Section for the correct pin numbers for the points listed.**
- **NOTE: Before starting the test drive, make sure the line to the fuel pressure gauge and the test equipment wires are properly connected and routed to avoid pinching or crimping.**
- Turn the ignition key to the ON position and watch the fuel pressure gauge. Pressure should increase with the key On and the engine cranking.

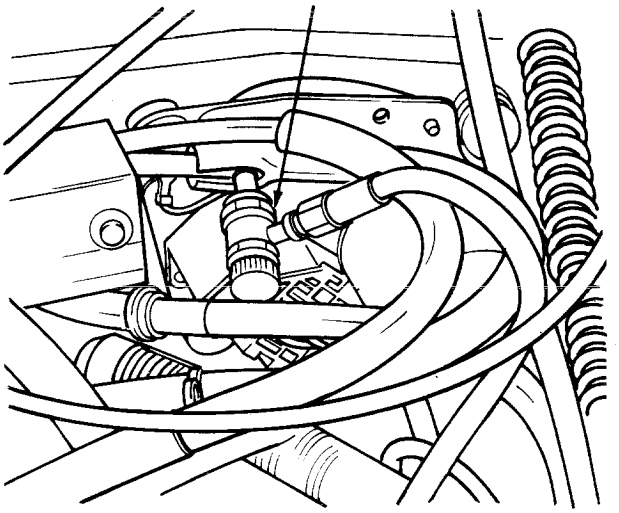
Intermittent Surging At A Steady Speed

STEPS	POSSIBLE ACTION TO TAKE
• Run the engine for three minutes. Then, bump the throttle and watch the vacuum gauge. EGR vacuum should increase momentarily when the throttle is bumped. If vacuum doesn't change, the gauge may not be installed correctly. • Before going on the test drive, enter the continuous monitor or "wiggle test" mode with the black STAR tester. • With an assistant take the vehicle on a test drive and operate the vehicle in the same way the customer did to try to repeat the intermittent problem. • Check and record the sensor and gauge readings at the concern speed with the vehicle running properly. When the vehicle surges, have the assistant note the readings on the gauges and breakout box. Then compare them to the good readings.	• If during the test drive the surge is detected and the readings on the breakout box, vacuum gauge, or fuel pressure gauge differ from the baseline readings, this could be where the problem lies. • If the STAR tester "beeps" during the test drive, enter the Quick Test and retrieve the memory code. Follow the procedures located in the Quick Test Section.

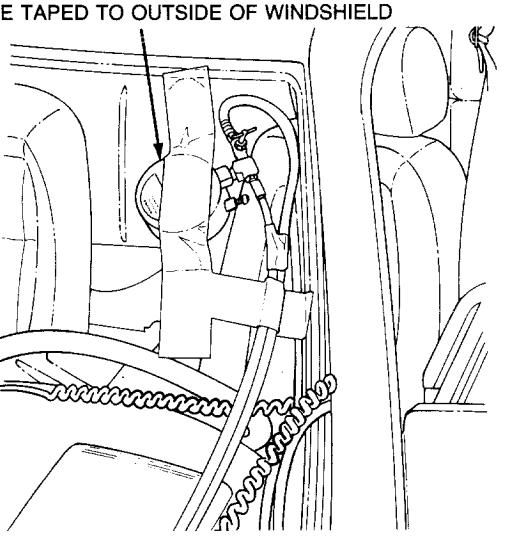
Intermittent Quits On Road And Restarts

STEPS	POSSIBLE ACTION TO TAKE
• Review the repair order. **If required, contact the driver or drivers of the vehicle to get further information. Refer to the Customer Contact Sheet on page 2 of this Section.** • Check for any TSBs that might apply, starting with those that relate to what you observed on the test drive.	• If repair order shows any pattern (e.g., quits on road and restarts occurs whenever the engine is warm or cold), try to duplicate the same condition.
• Visually inspect the engine compartment. **DO NOT disturb anything.**	• If you determine by a visual inspection that anything is disconnected, **do not reconnect the item. If you move any component or connection, you could make it harder to repeat the intermittent problem. NOTE: Look for areas where electrical wires or vacuum lines could be cut by sharp edges or burned by engine hot spots. Blocked or kinked vacuum lines can also cause trouble.**
• Install a fuel pressure gauge with an extension hose that allows you to tape the gauge to the windshield.	• After the test drive, check out any signs of trouble you noted during the test drive. • If the power to the ECA was interrupted, check the circuit for shorts or opens. Also, check the EEC power relay for correct operation. • If there was a loss of fuel pressure, check the fuel pump connections at the fuel pump and fuel pump relay.

ROTUNDA FUEL PRESSURE TESTING GAUGE 014-00447 — TYPICAL HOOK-UP TO FUEL PRESSURE VALVE

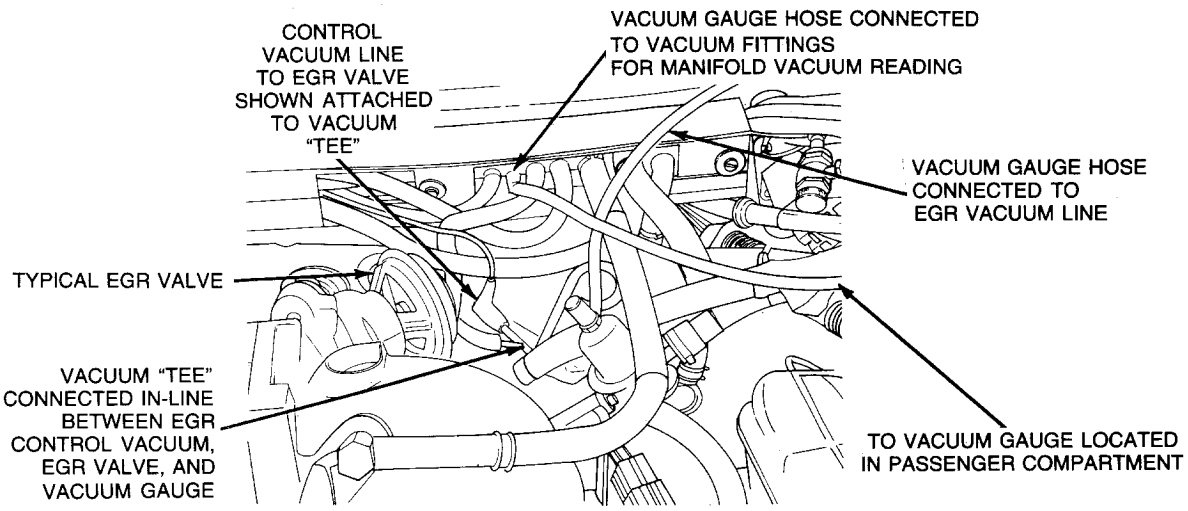


ROTUNDA FUEL PRESSURE TESTING GAUGE 014-00447 — TYPICAL HOOK-UP SHOWING GAUGE TAPED TO OUTSIDE OF WINDSHIELD



Intermittent Quits On Road And Restarts

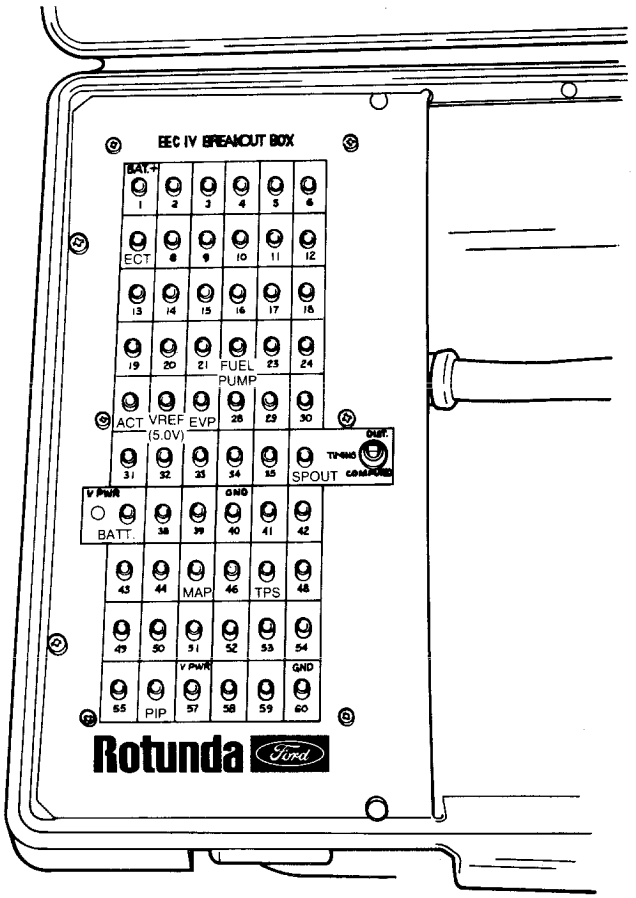
STEPS	POSSIBLE ACTION TO TAKE
NOTE: For 2.3L and 2.5L HSC engines, and other applications without a Schrader Valve installed in the fuel system, use Rotunda Tool D85L-9974-B, In-Line Pressure Tester Adapter. • Install a vacuum gauge and "tee" into the vacuum line to the EGR valve.	
• Connect a DVOM to monitor the battery power to the ECA during the test drive. • Start the vehicle and verify idle speed, following the procedure in Volume H. • Take the vehicle on a short test drive checking the vacuum and fuel pressure gauges and the DVOM occasionally. • If the vehicle quits, check the gauges and DVOM for any signs of trouble with EGR vacuum, fuel pressure, or battery power to the ECA.	
• **If the intermittent fault is still present, refer to Section 2.**	• **If after referring to Section 2 and running the Quick Test according to procedures found in this book, the fault is not found, continue to the next step.**
NOTE: Do not continue to the next step unless the Quick Test has not been performed according to procedures outlined in this book, and the intermittent fault has NOT been found.	



Intermittent Quits On Road And Restarts

STEPS	POSSIBLE ACTION TO TAKE
• If the Quick Test did not find the cause of the intermittent fault, prepare the vehicle for another road test. • Verify that the fuel pressure gauge is still attached securely to the windshield. Hook up the Black STAR tester and connect the breakout box. • Label the following key points on the breakout box: — battery voltage — reference voltage — throttle position sensor — PIP signal — ECT sensor — ACT sensor — SPOUT signal — fuel pump (circuit at ECA)	• Make a copy of the five-column chart located at the end of this Section and record the readings taken with the ignition key in the ON position and also while the engine was cranking. • These are "baseline" readings of key voltages while the engine is operating properly. By comparing these baseline readings with the readings when the intermittent symptom occurs, it is possible to isolate the component or circuit that is at fault.

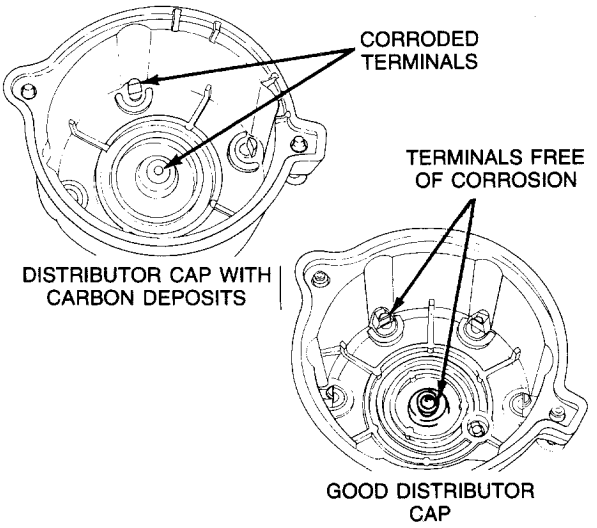
ROTUNDA EEC-IV 60-PIN BREAKOUT BOX 014-00322 — WITH KEY PINS LABELED



Intermittent Quits On Road And Restarts

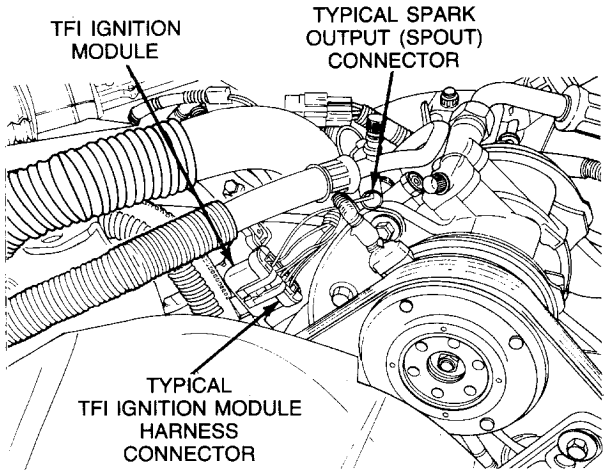
STEPS	POSSIBLE ACTION TO TAKE
• **NOTE: Refer to the correct vehicle "Engine Supplement" Section for the correct pin numbers for the points listed.**	
• Test drive the vehicle. If it quits, **do not** touch the ignition key. Coast to the side of the road. • Check the reading obtained on the breakout box with the baseline readings taken before the test drive.	• Perform a Quick Test according to procedures in Volume H.

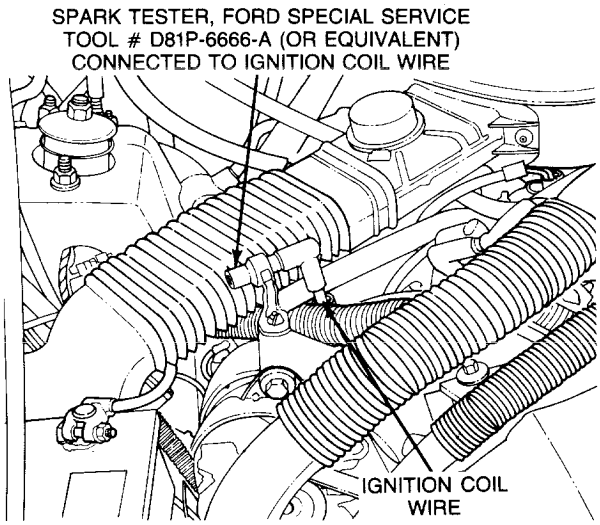
Intermittent Bucking And Jerking

STEPS	POSSIBLE ACTION TO TAKE
• Review the repair order. **If required, contact the driver or drivers of the vehicle to get further information. Refer to the Customer Contact Sheet on page 2 of this Section.**	• If repair order shows any pattern (e.g., vehicle bucks or jerks at a certain speed when the engine is warm or cold), duplicate the condition and try to start the vehicle.
• Visually inspect the engine compartment. **DO NOT disturb anything.**	• If you determine by a visual inspection that anything is disconnected, **do not reconnect the item. If you move any component or connection, you could make it harder to repeat the intermittent problem. NOTE: Look for areas where electrical wires or vacuum lines could be cut by sharp edges or burned by engine hot spots. Blocked or kinked vacuum lines can also cause trouble.**
• Check the ignition system secondary wires for damage or loose connections.	• If ignition system secondary wires are **not** damaged or loose, continue to the next step. • If secondary wires are damaged, replace them and try to duplicate the intermittent fault. • If secondary wires are loose, repair as necessary and try to duplicate the intermittent fault.
• Check distributor cap for moisture, cracks, or salt-like deposits.  	• If distributor cap has moisture, find the cause. If necessary, replace the cap. • If distributor cap has cracks or salt-like deposits, replace the cap with a new one. • Start the vehicle and try to duplicate the intermittent fault.
• Check the rotor for damage or burns.	• If rotor is damaged or burned, replace with a new one.

Intermittent Bucking And Jerking

STEPS	POSSIBLE ACTION TO TAKE
• Check the TFI ignition module for damage or loose connections. **NOTE: Do not use the TFI ignition module as a fulcrum for turning the distributor.**	• Replace the TFI ignition module if damaged.
• Check the TFI ignition module six-pin connector to ensure it is installed correctly and that the gasket is properly installed and not folded over.	• Repair any loose connections. Reinstall connector if not properly installed.
• Install a spark tester to the ignition system coil wire. **NOTE: Disconnect the wire at the distributor.** Crank the engine.	• If a good, strong blue spark is not detected, perform ignition diagnostics according to Ignition Section in Volume H.



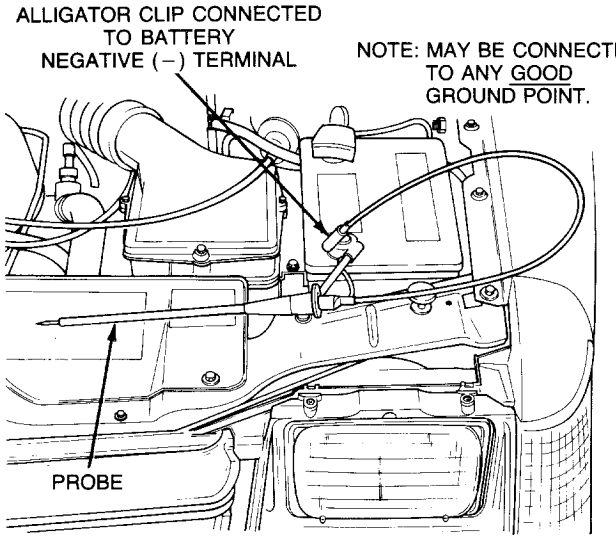


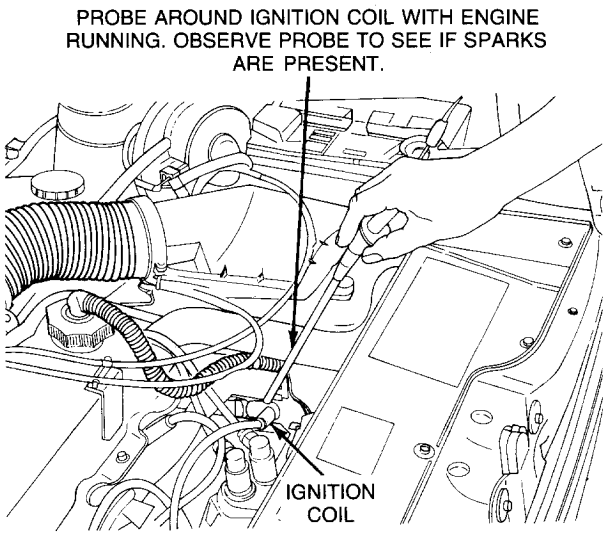
Intermittent Bucking And Jerking

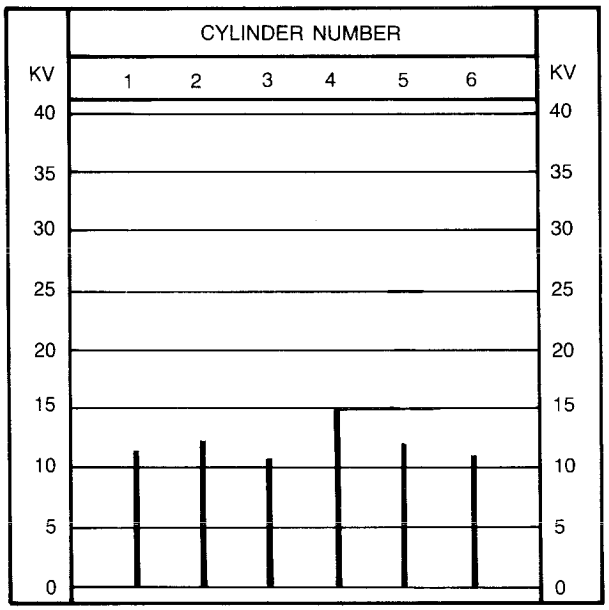
STEPS	POSSIBLE ACTION TO TAKE
• Verify that a good, strong blue spark is observed while the engine is cranking. This indicates that the coil and primary circuit are OK. • **NOTE: By connecting the spark tester to the coil wire, you are able to verify that the coil is firing on each PIP signal.** **NOTE: Never allow the spark from the coil wire to go directly to ground. This could cause internal damage to the coil.**	• If an intermittent spark is present, the ignition coil may be damaged internally.
• With the spark tester still connected to the coil wire, wiggle the ignition primary connectors while cranking the engine. **NOTE: By performing this test while cranking, those circuits dedicated to the start mode are checked.**	• If an intermittent loss of spark is detected, there could be an intermittent open in the TFI ignition module connector or harness that could cause an intermittent bucking and jerking. • **NOTE: An intermittent open in the TFI ignition module or harness could cause an intermittent bucking and jerking by preventing the TFI ignition module from firing the coil at certain times.** • **NOTE: An intermittent open in the coil primary harness or connecter could cause an intermittent bucking and jerking because the coil is not receiving battery voltage.**
• **NOTE: For the following test the engine MUST be running.** Use a jumper wire with an alligator clip at both ends. Attach one of the clips to a **good** ground location. Attach the other end to the metal part of a screwdriver. While the engine is running, pass the screwdriver around the base of the coil. **WARNING: USE CAUTION NOT TO GET THE SCREWDRIVER OR WIRE ENTANGLED WITH THE DRIVE BELTS OF THE VEHICLE.**	• Arcing indicates a breakdown in the insulation of the coil. • Replace the coil.

Intermittent Bucking And Jerking

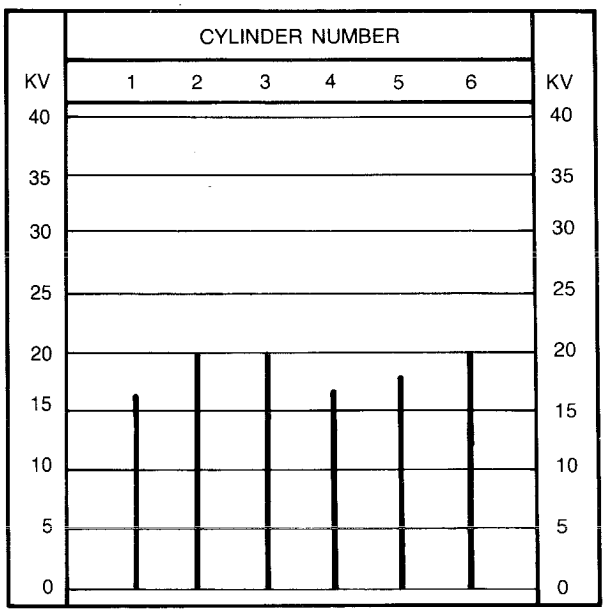
STEPS	POSSIBLE ACTION TO TAKE
• Connect an engine analyzer to the vehicle. • Check plug firing voltages, cylinder balance, and base timing.	• If the engine analyzer shows a problem, repair or replace as required.





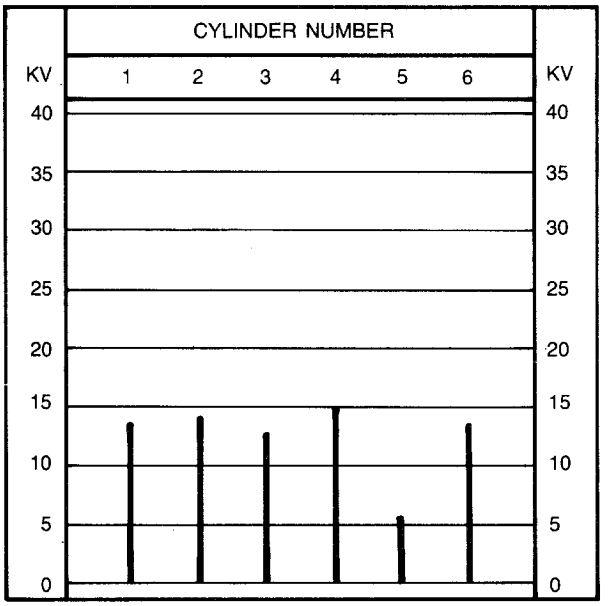


ENGINE ANALYZER DISPLAYS — PROPERLY OPERATING IGNITION SYSTEM

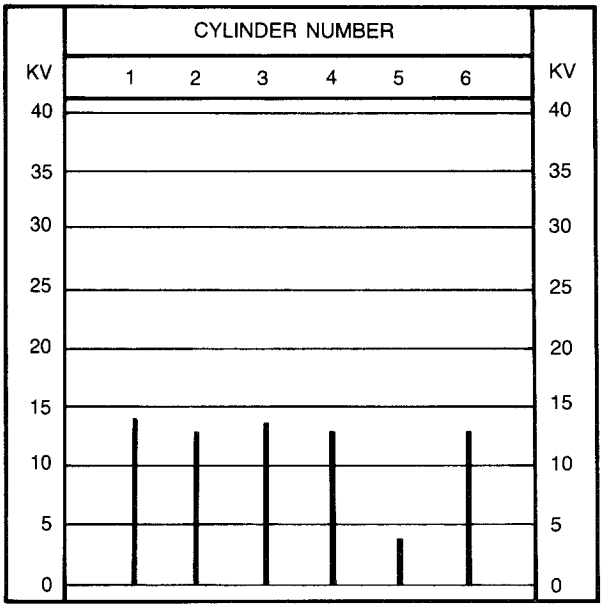


ENGINE ANALYZER DISPLAYS — AVERAGE PLUG FIRING VOLTAGE GREATER THAN 15KV

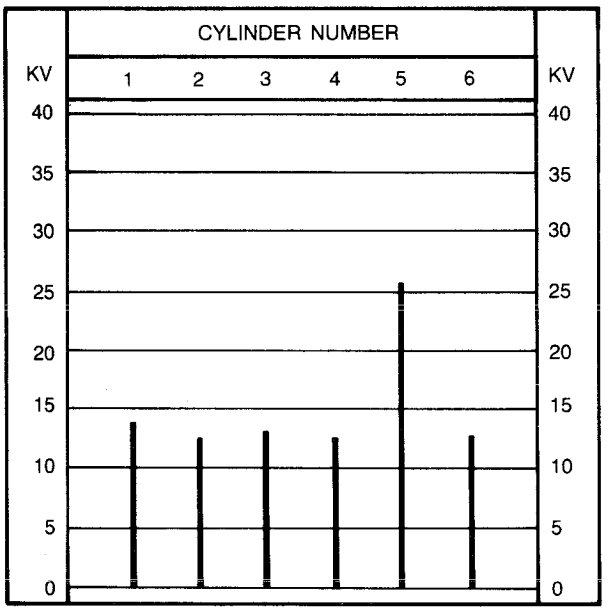
Intermittent Bucking And Jerking



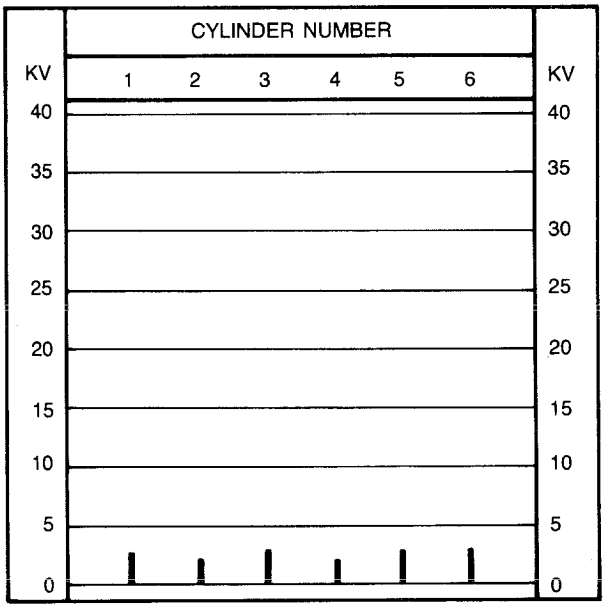
ENGINE ANALYZER DISPLAYS — PLUG FIRING VOLTAGE VARIATION GREATER THAN 5 KV



ENGINE ANALYZER DISPLAYS — LOW PLUG FIRING VOLTAGE IN ONE CYLINDER



ENGINE ANALYZER DISPLAYS — HIGH PLUG FIRING VOLTAGE IN ONE CYLINDER

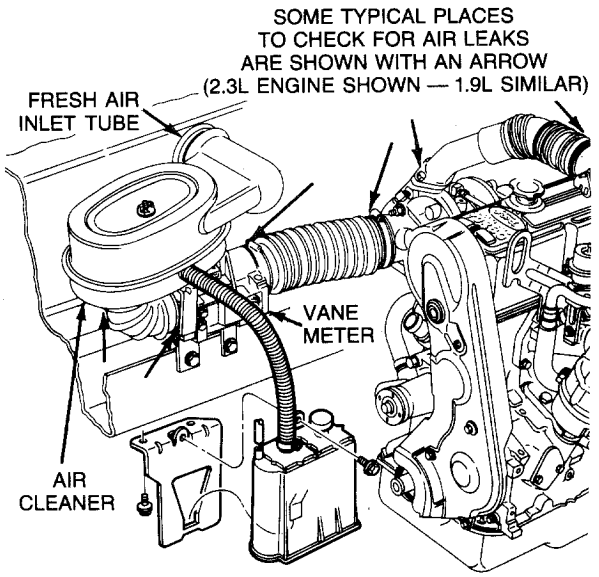


ENGINE ANALYZER DISPLAYS — NEGATIVE FIRING VOLTAGE

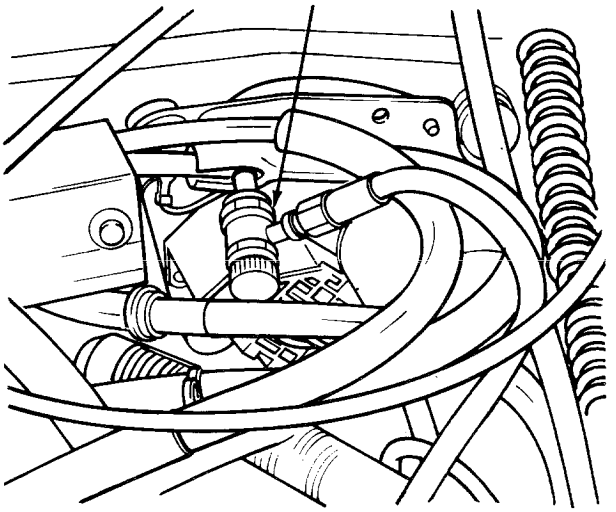
Intermittent Bucking And Jerking

STEPS	POSSIBLE ACTION TO TAKE
• When all tests have been performed on the engine analyzer, check the spark plugs for ash fouling, proper gap, and to make sure they are the right type of plug for the vehicle's engine.	• If the spark plugs are fouled, clean or replace as required. If the spark plugs have an improper gap, regap and install. If the spark plugs are not the correct type, replace with the correct type of plugs. • If the spark plugs check out OK, continue on to the next step.
• **If the intermittent fault is still present, refer to Section 2.**	• **If after referring to Section 2 and running the Quick Test according to procedures found in this book, the fault is not found, continue to the next step.**
NOTE: Do not continue to the next step unless the Quick Test has been performed according to procedures outlined in this book, and the intermittent fault has NOT been found.	
• Connect a MAP/BP tester to either the manifold absolute pressure (MAP) or barometric pressure (BP) sensor (depending on how vehicle is equipped) and check the readings with the engine Off and the ignition key in the ON position. • Compare the reading to the correct value listed on page 50 of this supplement. • If the vehicle is equipped with a MAP sensor, repeat the MAP test with the engine running. The MAP tester reading should decrease at idle and increase when you bump the throttle. **NOTE: If the vehicle is equipped with a barometric pressure (BP) sensor, the engine running portion of the test does not have to be performed since there is no vacuum hookup to the engine.**	• On a vehicle equipped with a MAP sensor, if the reading obtained with the engine OFF and ignition key ON does not match the value given in the Pinpoint Test, perform the appropriate Pinpoint Test in Volume H. • If the MAP sensor does not change when you bump the throttle with the engine running, substitute a known good hose for the original MAP sensor vacuum hose connected to the sensor and repeat the test. A change in the MAP tester reading indicates that the original hose was damaged, blocked or kinked. • On a vehicle equipped with either a MAP or BP sensor, substitute with a known good component and retest. If readings are now OK, replace the component.
NOTE: For 2.3L and 2.5L HSC engines, and other applications without a Schrader Valve installed in the fuel system, use Rotunda Tool D85L-9974-B, In-Line Pressure Tester Adapter. • If the vehicle is equipped with a vane meter, **carefully** check for unmetered air leaks (i.e., loose air tubes, missing hoses or vacuum caps, etc.)	• Correct air or vacuum leaks as necessary.

Intermittent Bucking And Jerking

STEPS	POSSIBLE ACTION TO TAKE
	
• With the breakout box installed monitor vane meter signal while you manually move the vane meter door through its entire range.	• Voltage must increase smoothly as door is opened. • If not, repair or replace.
• Install a fuel pressure gauge with an extension hose, so that the fuel pressure can be monitored during the test drive. (Tape the fuel pressure gauge to the windshield for easy viewing.)	• Make a copy of the five-column chart at the end of this section and record the readings on the breakout box, vacuum gauge and fuel pressure gauge taken with the ignition key in the ON position while the engine was cranking.

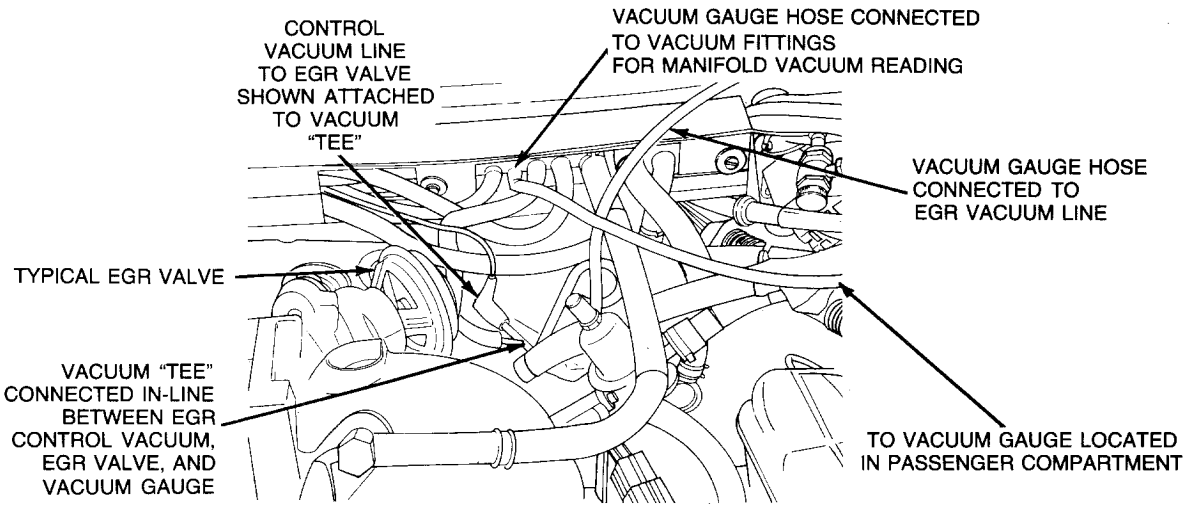
ROTUNDA FUEL PRESSURE TESTING GAUGE 014-00447 — TYPICAL HOOK-UP TO FUEL PRESSURE VALVE



ROTUNDA FUEL PRESSURE TESTING GAUGE 014-00447 — TYPICAL HOOK-UP SHOWING GAUGE TAPED TO OUTSIDE OF WINDSHIELD

Intermittent Bucking And Jerking

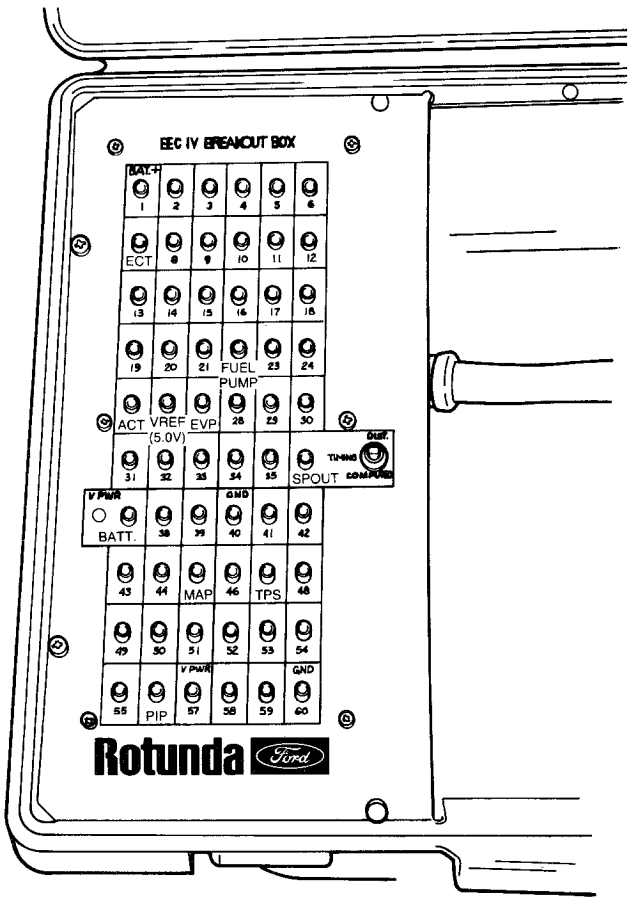
STEPS	POSSIBLE ACTION TO TAKE
• "Tee" a vacuum gauge and extension hose into the EGR valve vacuum line and manifold vacuum line (use a 0-to-100 inches of water vacuum gauge). Install a black STAR tester. Route the STAR tester and vacuum gauges inside the vehicle so you can read them.	• These are "baseline" readings of key voltages, vacuum condition, and fuel pressure while the engine is operating properly. By comparing these baseline readings with the readings when the intermittent symptom occurs, it is possible to isolate the component or circuit that is at fault.



• Hook up the breakout box with the following key points labeled on the breakout box:

— battery voltage
— reference voltage
— throttle position sensor
— PIP signal
— ECT sensor
— ACT sensor
— SPOUT signal
— fuel pump (circuit at ECA)

Intermittent Bucking And Jerking

STEPS	POSSIBLE ACTION TO TAKE
ROTUNDA EEC-IV 60-PIN BREAKOUT BOX 014-00322 — WITH KEY PINS LABELED  • **NOTE: Refer to the correct vehicle "Engine Supplement" Section for the correct pin numbers for the points listed.** • **NOTE: Before starting a test drive, make sure the line to the fuel pressure gauge and the test equipment wires are properly connected and routed to avoid pinching or crimping.** • Turn the ignition key to ON and watch the fuel pressure gauge. Pressure should increase with the key On and the engine cranking.	
• Run the engine for three minutes. Then, bump the throttle and watch the vacuum gauge. EGR vacuum should increase momentarily when the throttle is bumped. If vacuum doesn't change, the gauge may not be installed correctly.	• If during the test drive the fault is detected and the readings on the breakout box, vacuum gauges, or fuel pressure gauge differ from the baseline readings, this could be where the problem lies.

Intermittent Bucking And Jerking

STEPS	POSSIBLE ACTION TO TAKE
• Before going on the test drive, enter the continuous monitor or "wiggle test" mode with the black STAR tester. • Turn the radio to the low end of the AM band. **This checks for internal arcing in the coil, since the arcing would be picked up as noise on the radio.** • With an assistant take the vehicle on a test drive and operate the vehicle in the same way the customer did to try repeat the intermittent problem. • Check and record the sensor and gauge readings at the concern speed with the vehicle running properly. If the vehicle bucks or jerks, have the assistant note the readings on the gauges and breakout box. Then compare them to the good readings.	• If the STAR tester "beeps" during the test drive, enter the Quick Test and retrieve the memory code. Follow the procedures located in the Quick Test Section.

Intermittent Erratic Running/Rough Idle

STEPS	POSSIBLE ACTION TO TAKE
• Review the repair order. **If required, contact the driver or drivers of the vehicle to get further information. Refer to the Customer Contact Sheet on page 2 of this Section.**	• If repair order shows any pattern (e.g., vehicle idles rough or has erratic engine operation whenever the engine is warm or cold or at a certain speed), try to duplicate the condition.
• Visually inspect the engine compartment. **DO NOT disturb anything.**	• If you determine by a visual inspection that anything is disconnected, **do not reconnect the item. If you move any component or connection, you could make it harder to repeat the intermittent problem. NOTE: Look for areas where electrical wires or vacuum lines could be cut by sharp edges or burned by engine hot spots. Blocked or kinked vacuum lines can also cause trouble.**
• On EFI (multi-point) engines, check the color at the top of the fuel injectors to see that they are the same.	• If they are not the same, refer to the chart in this Section to determine the correct color code for the engine being worked on, and replace incorrect injectors with the correct injectors.

Intermittent Erratic Running/Rough Idle

The following charts list fuel injector applications, part numbers, source, color code and injector specifications.

HIGH PRESSURE CFI INJECTOR APPLICATION

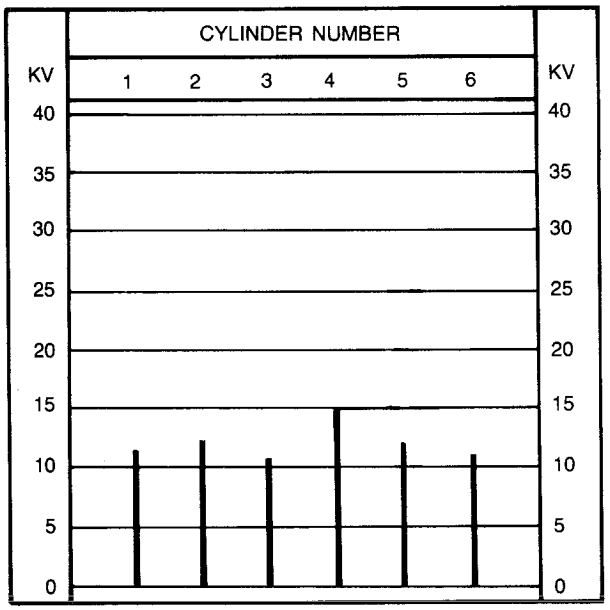
ENGINE APPLICATION	MODEL YEAR	PART NO. - 9F593 -	SOURCE	COLOR CODE	INJECTOR SPECS.	
					SIZE	RESIST
					gm/sec	Ohms
1.6L	1983	E3EE-BA	Bosch	Blue	1.76 (14#/HR)	2.25
	1984	E4EE-AA	N.D.	Blue		2.35
1.6L T/C	1984-85	E4EX-AA	Bosch	Black	3.00 (23#/HR)	2.40
1.9L	1985-1/2-86	E6EE-AB	Bosch	White	2.45 (19#/HR)	2.25
2.3L T/C	1983	E3ZE-BA	Bosch	Green	3.86 (30#/HR)	2.40
	1984	E4ZE-AA	D.K.K.			2.35
	1985	E5ZE-AA	D.K.K.	Brown	4.41 (35#/HR)	2.35
	1986	E5ZE-AB	D.K.K.			
2.3L (Truck)	1985	E59E-AA	N.D.	Gray	1.76 (14#/HR)	16.20
	1986	E59E-AB	N.D.			
2.9L (Car/Truck)	1986	E67C-A1B	Bosch	Gray	1.76 (14#/HR)	14.50
3.0L (Car/Truck)	1986	E59E-AB	N.D.	Gray	1.76 (14#/HR)	16.20
		E67E-BB	Bosch			14.50
3.8 CFI	1984-86	E3VE-A1A	Bosch	Green	4.54 (37#/HR)	2.25
		-A2A	N.D.			2.00
5.0L CFI	1980	EOSE-AA	Bosch	Blue	5.81 (46#/HR)	2.40
	1983	EOSE-A1A	Bosch			2.40
		EOSE-A2A	N.D.			2.00
	1984	EOSE-A1A	Bosch			2.25
		EOSE-A2A	N.D.			2.00
5.0L H.O. CFI	1984-85	E4ZE-CA	Bosch	Gray	6.60 (52#/HR)	2.25
5.0L SEFI	1986	E59E-AB	N.D.	Gray	1.76 (14#/HR)	16.20
		E67E-BB	Bosch			14.50
5.0L H.O. SEFI	1986	E6TE-AB	N.D.	Gold	2.45 (19#/HR)	16.20
5.0L Truck	1985	E5TE-AA	Bosch	Gold	2.45 (19#/HR)	15.50
		E5TE-AA	N.D.			16.20
		E5TE-AA	D.K.K.			16.20
	1986	E5TE-AB	D.K.K.			16.20
		E5TE-BB	Bosch			14.50

LOW PRESSURE CFI INJECTOR APPLICATIONS

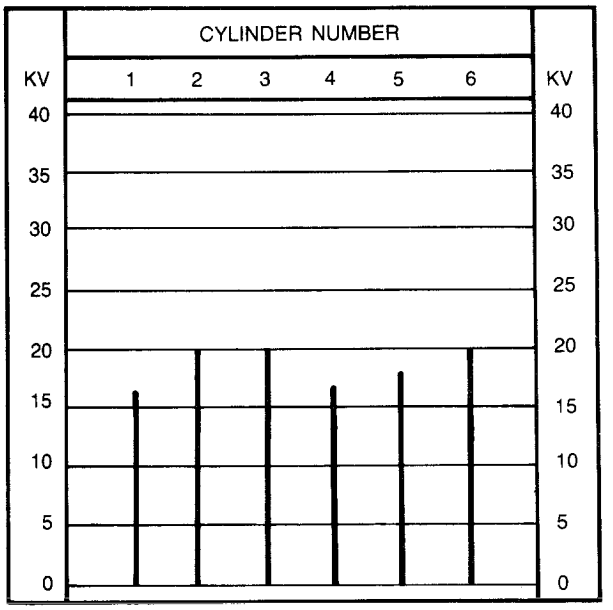
2.3L HSC	1985-86	E43E-AC	Bosch	Blue	7.00 (56#/HR)	1.40
2.3L H.O. HSC (Manual Trans. Only)	1985	E53E-AB	Bosch	Green	8.00 (64#/HR)	1.40
2.5L HSC	1986	E53E-AB	Bosch	Green	8.00 (64#/HR)	1.40

Intermittent Erratic Running/Rough Idle

STEPS	POSSIBLE ACTION TO TAKE
• Check distributor cap for moisture, cracks, or salt-like deposits.	• If distributor cap has moisture, find out the cause. If necessary, replace the cap. • If distributor cap has cracks or salt-like deposits, replace the cap with a new one.
• Connect an engine analyzer to the vehicle. • Check plug firing voltages, cylinder balance, and base timing.	• If the engine analyzer shows a problem, repair or replace as required.

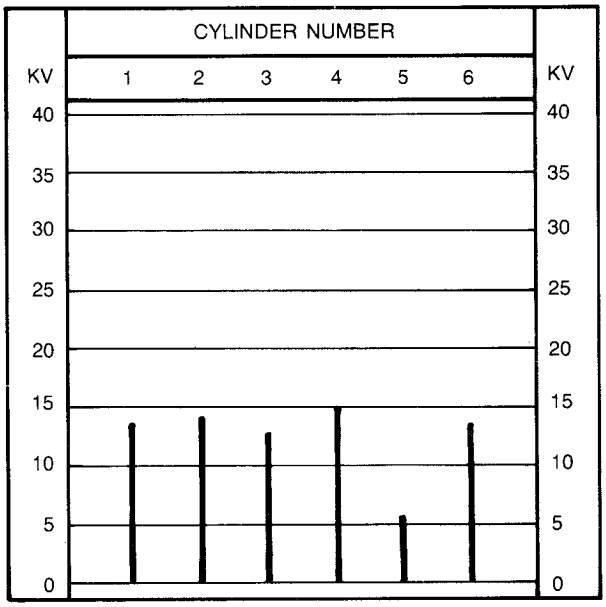


ENGINE ANALYZER DISPLAYS — PROPERLY OPERATING IGNITION SYSTEM

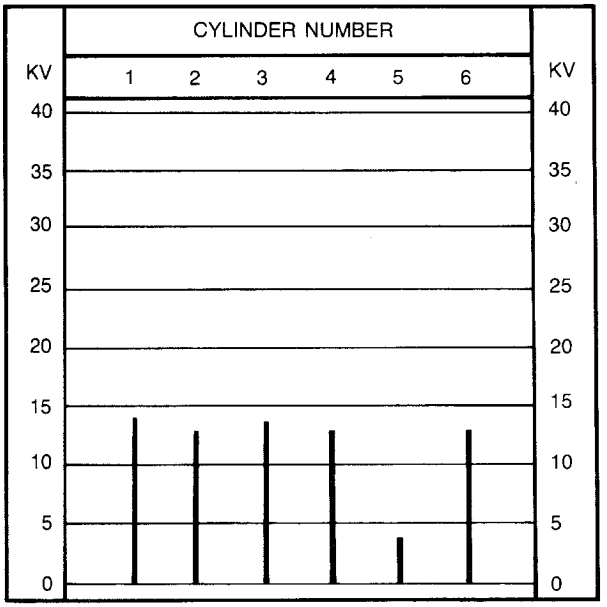


ENGINE ANALYZER DISPLAYS — AVERAGE PLUG FIRING VOLTAGE GREATER THAN 15KV

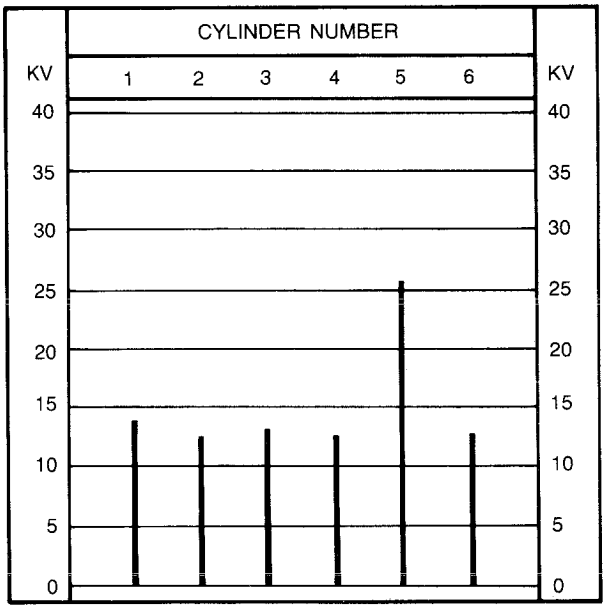
Intermittent Erratic Running/Rough Idle



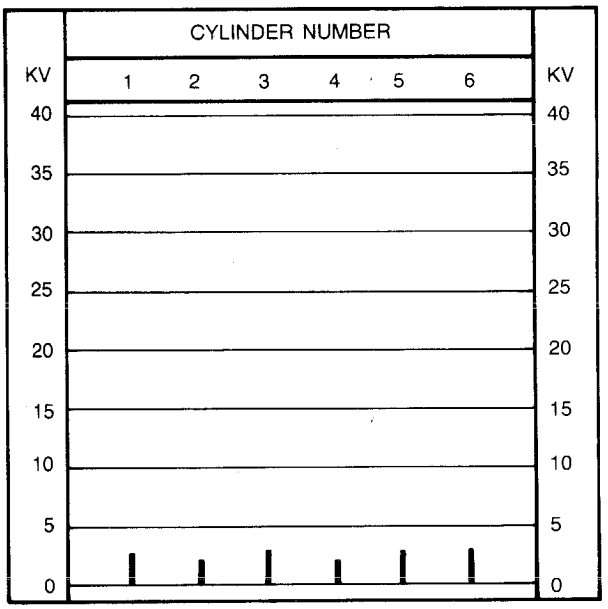
ENGINE ANALYZER DISPLAYS — PLUG FIRING VOLTAGE VARIATION GREATER THAN 5 KV



ENGINE ANALYZER DISPLAYS — LOW PLUG FIRING VOLTAGE IN ONE CYLINDER



ENGINE ANALYZER DISPLAYS — HIGH PLUG FIRING VOLTAGE IN ONE CYLINDER



ENGINE ANALYZER DISPLAYS — NEGATIVE FIRING VOLTAGE

Intermittent Erratic Running/Rough Idle

STEPS	POSSIBLE ACTION TO TAKE
• When all tests have been performed on the engine analyzer, check the spark plugs for ash fouling, proper gap, and to make sure they are the right type of plug for the vehicle's engine. • **NOTE: Do not replace spark plugs at this time.**	• If the spark plugs are fouled, clean or replace as required. If the spark plugs have an improper gap, regap and install. If the spark plugs are not the correct type, replace with the correct type of plugs. • If the spark plugs check out OK, continue to the next step.
• Perform a compression test to check for proper engine and valve train operation.	• If compression check shows a problem, repair or replace as required. • If compression check is OK, continue to the next step.
• Check out the TFI ignition module, profile ignition pickup, and coil by following the TFI-IV worksheet provided in this Section.	• If the TFI worksheet leads to the problem, repair or replace as required.

Intermittent Erratic Running/Rough Idle

TFI — WORKSHEET EEC-IV SYSTEMS — TYPICAL

TO PERFORM THESE TESTS YOU WILL NEED: 12V TESTLITE, DVOM AND A SUPPLY OF STRAIGHT PINS.

NOTE: Prior to starting Step 1, disconnect injectors to prevent flooding engine with fuel.

1. Voltage at positive coil — desired **12V**, actual _____ (Key On/Engine Off).
2. Voltage at negative coil — desired **12V**, actual _____ (Key On/Engine Off).

   TESTS 1 and 2 PERFORMED WITH IGNITION KEY ON.
3. Using testlite at negative coil, crank engine, watch that testlite flickers **OK**. If it does not flicker, **problem is indicated. Turn key OFF.**
4. Disconnect coil connector, measure primary and secondary coil resistances, also path to ground.

   Primary coil — .5-1.5 ohms desired, actual _____.

   Secondary coil — 7K-15K ohms desired, actual _____.

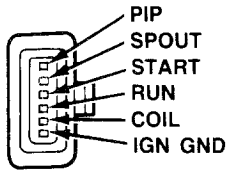
   Path to ground — ohms infinity desired, actual _____.

   Reconnect primary and secondary wires.
5. Disconnect TFI module connector at distributor, with DVOM on 20-volt scale.
6. Insert straight pins into connector to measure @ wiring harness:

   "Run" voltage — desired 12V, actual _____ (Key On/Engine Off).

   "Coil" voltage — desired 12V, actual _____ (Key On/Engine Off).

   "Start" voltage — desired 8-10V, actual _____ (engine cranking).



7. Check distributor to engine/block ground — desired 0 ohms, actual _____.
8. Check TFI module to distributor ground at Pin 6 — desired 0 ohms, actual _____. Reconnect TFI connector.
9. Check Hall effect device output @ SPOUT harness connector while cranking engine — desired 5-7V, actual _____ (distributor side of connector).
10. If #9 is not correct, disconnect ECA and redo test at Pin #56 — desired 5-7V, actual _____. **NOTE: Either a power relay or damaged ECA can cause "no-spark."**
11. If #10 is not correct, check continuity of blue PIP wire to distributor from Pin #56.
12. If #10 is correct, reconnect harness to a substitute processor and redo Step #9.
13. If you do not get 5-7V on SPOUT or PIP wires during crank in any of steps 9-12, Hall effect device in distributor is **probably** shorted.
14. Once you have a good 5-7V PIP signal, if you still do not have pulsating at negative coil the TFI module is bad — provided all the other steps 1-8 are OK. Reconnect injectors.

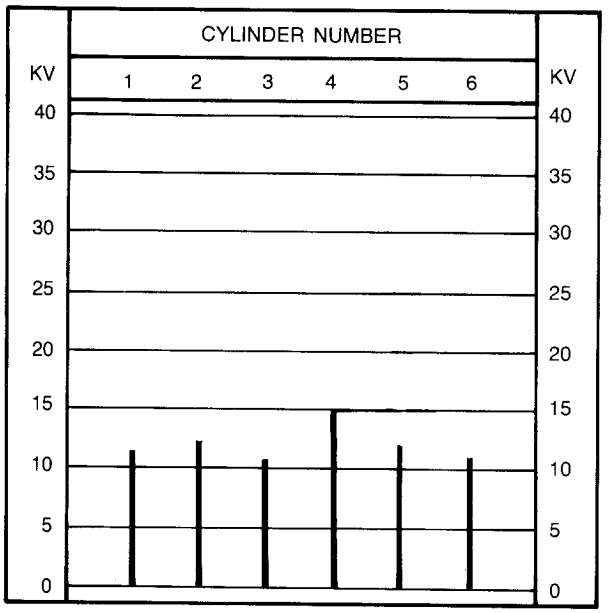
DO NOT SHORT-CUT THIS TEST — IF YOU DO SO YOU CAN DESTROY A NEW MODULE, A NEW HALL EFFECT DEVICE, A NEW PROCESSOR OR ALL THREE.

Intermittent Erratic Running/Rough Idle

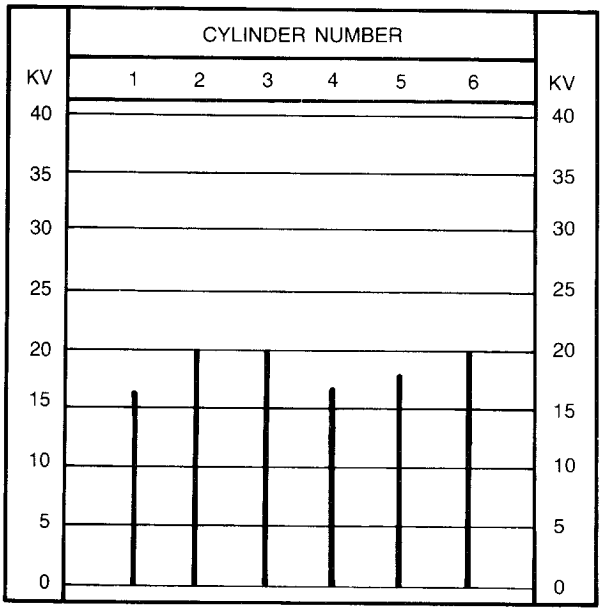
STEPS	POSSIBLE ACTION TO TAKE
• **NOTE: Be sure to use a low-current test light to avoid damaging the electronic control assembly (ECA).**	• If the TFI ignition module, profile ignition pickup, and coil are OK, continue on to the next step.
• Check out the SPOUT connector to ensure it is properly seated.	• If the SPOUT connector is loose, repair or replace as required. • If the SPOUT connector is seated properly, continue to the next step.
• **NOTE: For the following test, the engine MUST be running.** Use a jumper wire with an alligator clip at both ends. Attach one of the clips to a **good** ground location. Attach the other end to the metal part of a screwdriver. While the engine is running, pass the screwdriver around the base of the coil. **WARNING: USE CAUTION NOT TO GET THE SCREWDRIVER OR WIRE ENTANGLED WITH THE DRIVE BELTS OF THE VEHICLE.**	• Arcing indicates a breakdown in the insulation of the coil. If the coil is malfunctioning, the primary circuit could be open intermittently, causing an intermittent no-start condition.
• **If the intermittent fault is still present, refer to Section 2.**	• **If after referring to Section 2 and running the Quick Test according to procedures found in this book, the fault is not found, continue to the next step.**
NOTE: Do not continue to the next step unless the Quick Test has been performed according to procedures outlined in this book, and the intermittent fault has NOT been found.	
• Connect a MAP/BP tester to either the manifold absolute pressure (MAP) or barometric pressure (BP) sensor (depending on how vehicle is equipped) and check the readings with the engine Off and the ignition key in the ON position. • Compare the reading to the correct value listed on page 50 of this supplement. • If the vehicle is equipped with a MAP sensor, repeat the MAP test with the engine running. The MAP tester reading should decrease at idle and increase when you bump the throttle. **NOTE: If the vehicle is equipped with a barometric pressure (BP) sensor, the engine running portion of the test does not have to be performed since there is no vacuum hookup to the engine.**	• On a vehicle equipped with a MAP sensor, if the reading obtained with the engine OFF and ignition key ON does not match the value given in the Pinpoint Test, perform the appropriate Pinpoint Test in Volume H. • If the MAP sensor does not change when you bump the throttle with the engine running, substitute a known good hose for the original MAP sensor vacuum hose connected to the sensor and repeat the test. A change in the MAP tester reading indicates that the original hose was damaged, blocked or kinked. • On a vehicle equipped with either a MAP or BP sensor, substitute with a known good component and retest. If readings are now OK, replace the component.

Intermittent Erratic Running/Rough Idle

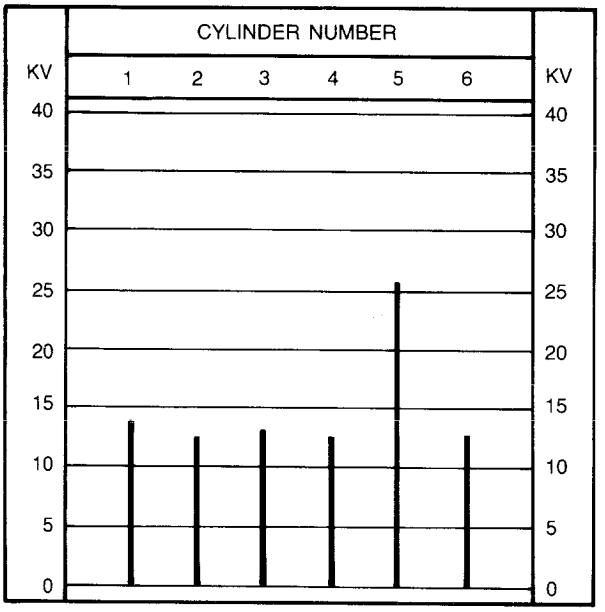
STEPS	POSSIBLE ACTION TO TAKE
• If the vehicle is equipped with a vane meter, **carefully** check for unmetered air leaks (i.e., loose air tubes, missing hoses or vacuum caps, etc.)	• Correct air or vacuum leaks as necessary.



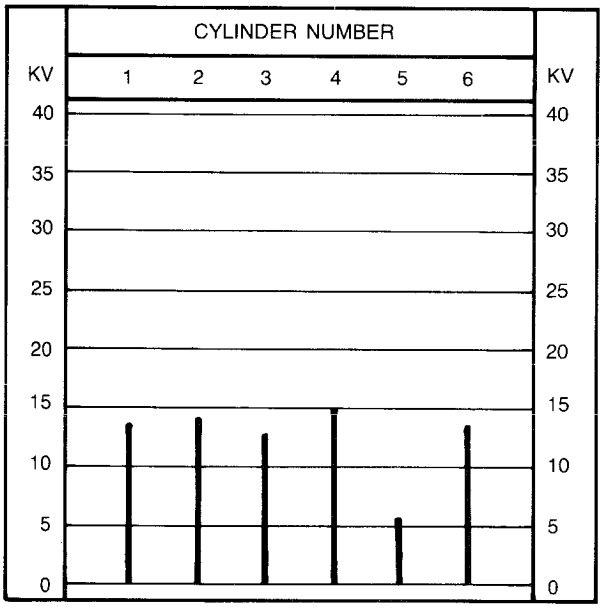
ENGINE ANALYZER DISPLAYS — PROPERLY OPERATING IGNITION SYSTEM



ENGINE ANALYZER DISPLAYS — AVERAGE PLUG FIRING VOLTAGE GREATER THAN 15KV

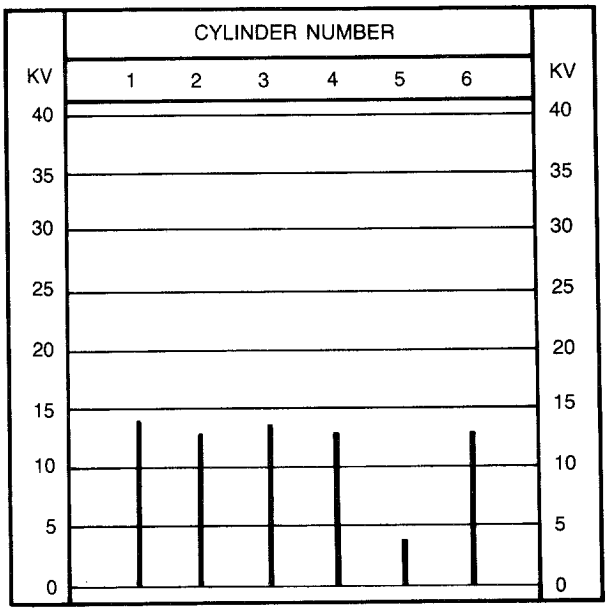
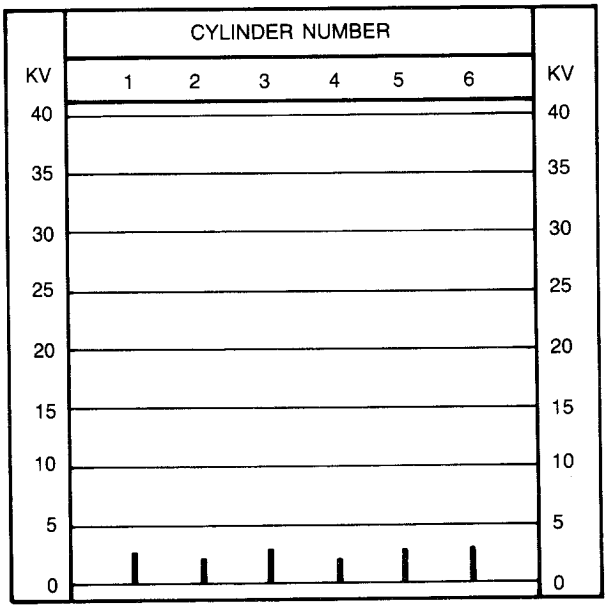


ENGINE ANALYZER DISPLAYS — HIGH PLUG FIRING VOLTAGE IN ONE CYLINDER



ENGINE ANALYZER DISPLAYS — PLUG FIRING VOLTAGE VARIATION GREATER THAN 5 KV

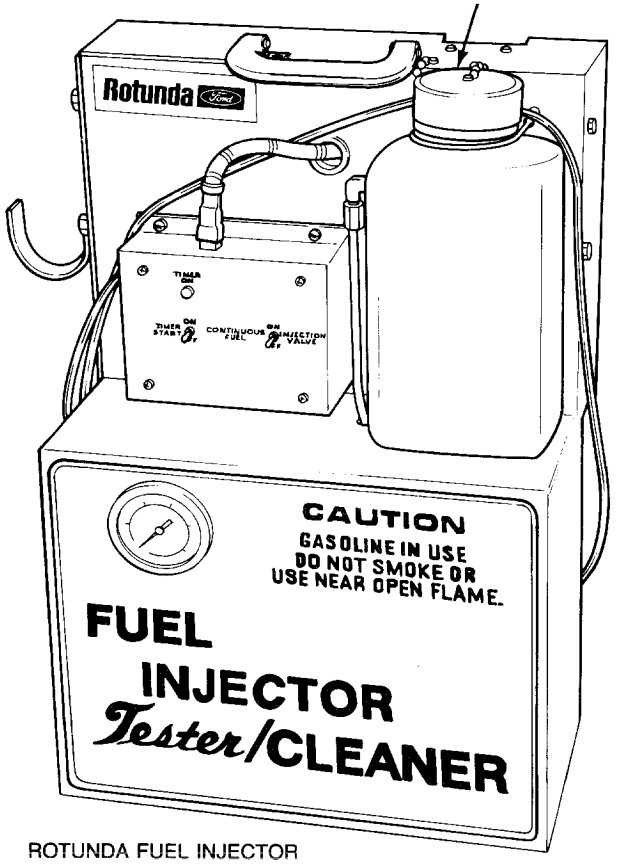
Intermittent Erratic Running/Rough Idle

STEPS	POSSIBLE ACTION TO TAKE
 ENGINE ANALYZER DISPLAYS — LOW PLUG FIRING VOLTAGE IN ONE CYLINDER	 ENGINE ANALYZER DISPLAYS — NEGATIVE FIRING VOLTAGE
• With breakout box installed monitor vane meter signal while you manually move the vane meter door through its entire range.	• Voltage must increase smoothly as door is opened.
• Connect a Rotunda Fuel Injector Tester/Cleaner to the vehicle according to instructions that come with the unit. • Check the flow of injectors against the specifications given with the Tester/Cleaner and the injector chart located in this test.	• If injector flow is not up to specifications, clean the injectors. Follow the instructions that come with the Tester/Cleaner.

Intermittent Erratic Running/Rough Idle

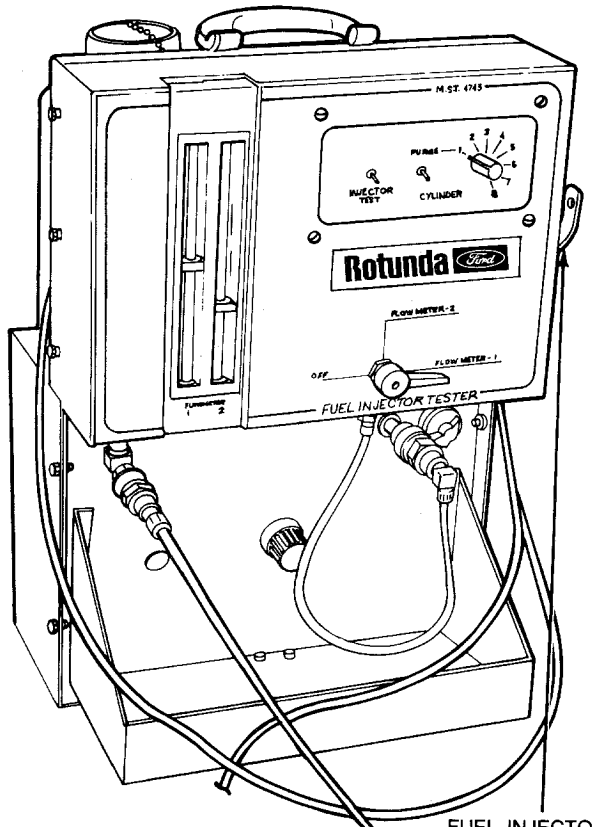
STEPS	POSSIBLE ACTION TO TAKE

TESTER/CLEANER FUEL RESERVOIR



ROTUNDA FUEL INJECTOR TESTER/CLEANER 113-00001

ROTUNDA FUEL INJECTOR TESTER/CLEANER 113-00001 — TYPICAL HOOK-UP TO FUEL INJECTORS AND FUEL PRESSURE VALVE



TO FUEL PRESSURE VALVE

FUEL INJECTOR CONNECTOR LEADS

Intermittent Erratic Running/Rough Idle

The following charts list fuel injector applications, part numbers, source, color code and injector specifications.

HIGH PRESSURE CFI INJECTOR APPLICATION

ENGINE APPLICATION	MODEL YEAR	PART NO. - 9F593 -	SOURCE	COLOR CODE	INJECTOR SPECS.	
					SIZE	RESIST
					gm/sec	Ohms
1.6L	1983	E3EE-BA	Bosch	Blue	1.76 (14#/HR)	2.25
	1984	E4EE-AA	N.D.	Blue		2.35
1.6L T/C	1984-85	E4EX-AA	Bosch	Black	3.00 (23#/HR)	2.40
1.9L	1985-1/2-86	E6EE-AB	Bosch	White	2.45 (19#/HR)	2.25
2.3L T/C	1983	E3ZE-BA	Bosch	Green	3.86 (30#/HR)	2.40
	1984	E4ZE-AA	D.K.K.			2.35
	1985	E5ZE-AA	D.K.K.	Brown	4.41 (35#/HR)	2.35
	1986	E5ZE-AB	D.K.K.			
2.3L (Truck)	1985	E59E-AA	N.D.	Gray	1.76 (14#/HR)	16.20
	1986	E59E-AB	N.D.			
2.9L (Car/Truck)	1986	E67C-A1B	Bosch	Gray	1.76 (14#/HR)	14.50
3.0L (Car/Truck)	1986	E59E-AB	N.D.	Gray	1.76 (14#/HR)	16.20
		E67E-BB	Bosch			14.50
3.8 CFI	1984-86	E3VE-A1A	Bosch	Green	4.54 (37#/HR)	2.25
		-A2A	N.D.			2.00
5.0L CFI	1980	EOSE-AA	Bosch	Blue	5.81 (46#/HR)	2.40
	1983	EOSE-A1A	Bosch			2.40
		EOSE-A2A	N.D.			2.00
	1984	EOSE-A1A	Bosch			2.25
		EOSE-A2A	N.D.			2.00
5.0L H.O. CFI	1984-85	E4ZE-CA	Bosch	Gray	6.60 (52#/HR)	2.25
5.0L SEFI	1986	E59E-AB	N.D.	Gray	1.76 (14#/HR)	16.20
		E67E-BB	Bosch			14.50
5.0L H.O. SEFI	1986	E6TE-AB	N.D.	Gold	2.45 (19#/HR)	16.20
5.0L Truck	1985	E5TE-AA	Bosch	Gold	2.45 (19#/HR)	15.50
		E5TE-AA	N.D.			16.20
		E5TE-AA	D.K.K.			16.20
	1986	E5TE-AB	D.K.K.			16.20
		E5TE-BB	Bosch			14.50

LOW PRESSURE CFI INJECTOR APPLICATIONS

2.3L HSC	1985-86	E43E-AC	Bosch	Blue	7.00 (56#/HR)	1.40
2.3L H.O. HSC (Manual Trans. Only)	1985	E53E-AB	Bosch	Green	8.00 (64#/HR)	1.40
2.5L HSC	1986	E53E-AB	Bosch	Green	8.00 (64#/HR)	1.40

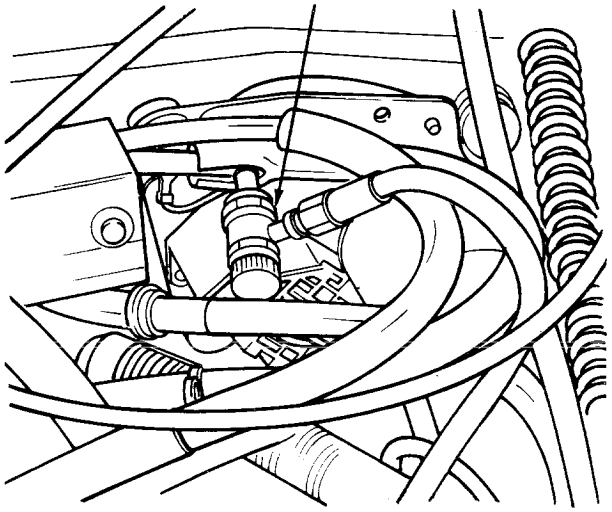
Intermittent Erratic Running/Rough Idle

STEPS	POSSIBLE ACTION TO TAKE
• Check the injector flow again.	• If the injectors still do not meet specifications, replace them.

NOTE: For 2.3L and 2.5L HSC engines, and other applications without a Schrader Valve installed in the fuel system, use Rotunda Tool D85L-9974-B, In-Line Pressure Tester Adapter.

- Install a fuel pressure gauge with an extension hose, so that the fuel pressure can be monitored during the test drive. (Tape the fuel pressure gauge to the windshield for easy viewing.)

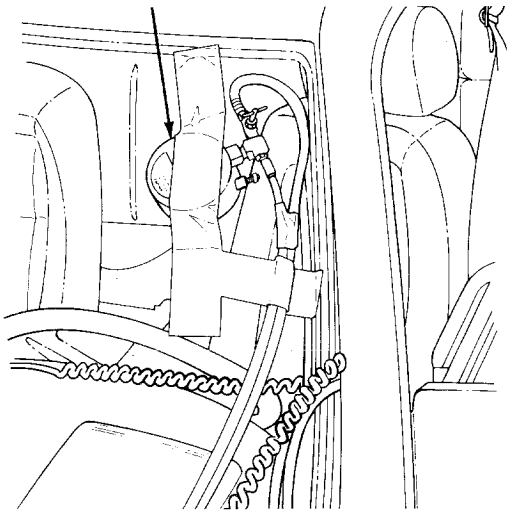
ROTUNDA FUEL PRESSURE TESTING GAUGE 014-00447 — TYPICAL HOOK-UP TO FUEL PRESSURE VALVE



- "Tee" a vacuum gauge and extension hose into the EGR valve vacuum line and manifold vacuum line (use a 0-to-100 inches of water vacuum gauge). Install a black STAR tester. Route the STAR tester and vacuum gauges inside the vehicle so you can read them.

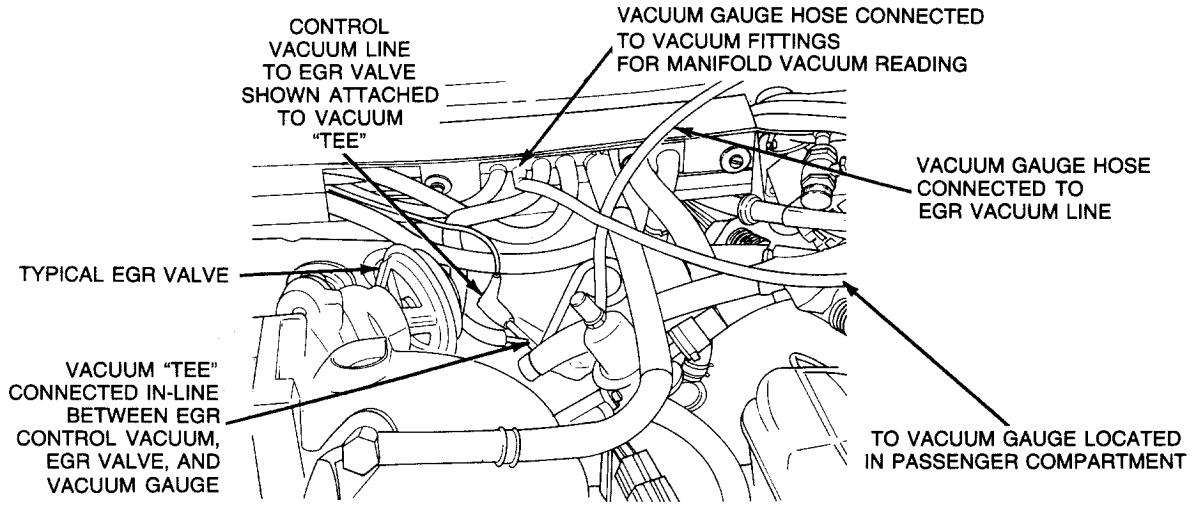
- Make a copy of the five-column chart at the end of this section and record the readings on the breakout box, vacuum gauge, and fuel pressure gauge taken with the ignition key in the ON position while the engine was cranking.
- These are "baseline" readings of key voltages, vacuum condition and fuel pressure while the engine is operating properly. By comparing these baseline readings with the readings when the intermittent symptom occurs, it is possible to isolate the component or circuit that is at fault.

ROTUNDA FUEL PRESSURE TESTING GAUGE 014-00447 — TYPICAL HOOK-UP SHOWING GAUGE TAPED TO OUTSIDE OF WINDSHIELD



Intermittent Erratic Running/Rough Idle

STEPS	POSSIBLE ACTION TO TAKE



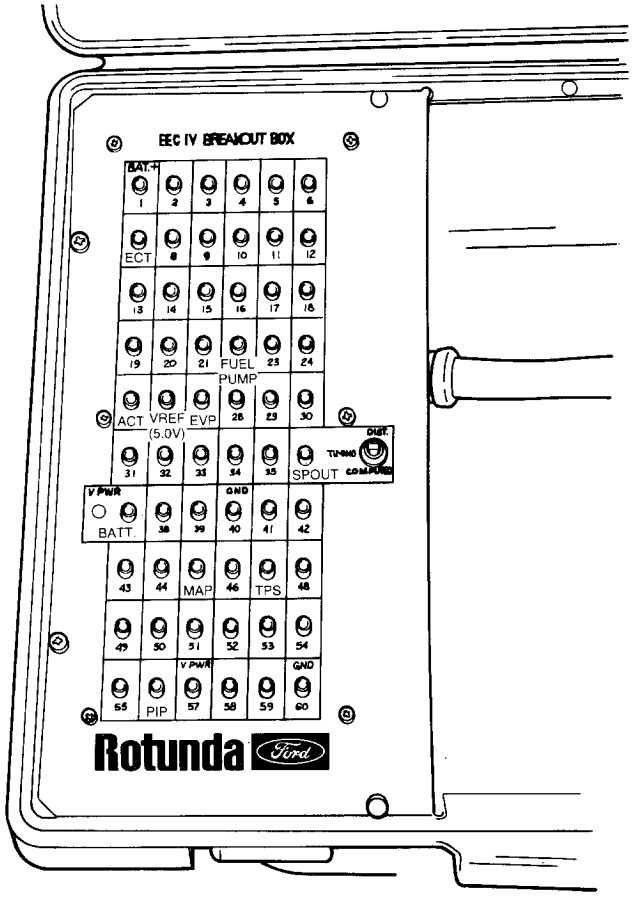
- Hook up the breakout box with the following key points labeled on the breakout box:

— battery voltage
— reference voltage
— throttle position sensor
— PIP signal
— ECT sensor
— ACT sensor
— SPOUT signal
— fuel pump (circuit at ECA)

Intermittent Erratic Running/Rough Idle

STEPS	POSSIBLE ACTION TO TAKE

ROTUNDA EEC-IV 60-PIN BREAKOUT BOX 014-00322 — WITH KEY PINS LABELED



- **NOTE: Refer to the correct vehicle "Engine Supplement" Section for the correct pin numbers for the points listed.**
- **NOTE: Before starting the test drive, make sure the line to the fuel pressure gauge and the test equipment wires are properly connected and routed to avoid pinching or crimping.**
- Turn the ignition key to ON and watch the fuel pressure gauge. Pressure should increase with the key On and the engine cranking.

Intermittent Erratic Running/Rough Idle

STEPS	POSSIBLE ACTION TO TAKE
• Run the engine for three minutes. Then, bump the throttle and watch the vacuum gauge. EGR vacuum should increase momentarily when the throttle is bumped. If vacuum doesn't change, the gauge may not be installed correctly. • Before going on the test drive, enter the continuous monitor or "wiggle test" mode with the black STAR tester. • Turn the radio to the low end of the AM band. **This checks for internal arcing in the coil, since the arcing would be picked up as noise on the radio.** • With an assistant take the vehicle on a test drive and operate the vehicle in the same way the customer did to try to repeat the intermittent problem. • Check and record the sensor and gauge readings at the concern speed with the vehicle running properly. If the engine starts to idle erratically, have the assistant note the readings on the gauges and breakout box. Then, compare them to the good readings.	• If during the test drive the fault is detected and the readings on the breakout box, vacuum gauges, or fuel pressure gauge differ from the baseline readings, this could be where the problem lies. • If the STAR tester "beeps" during the test drive, enter the Quick Test and retrieve the memory code. Follow the procedures located in the Quick Test Section.

Approximate Altitude (Ft.)	Voltage Output (+/−.04 Volts)
0	1.59
1000	1.56
2000	1.53
3000	1.50
4000	1.47
5000	1.44
6000	1.41
7000	1.39

NOTE: Measure several known good MAP sensors on available vehicles. The measured voltage will be typical for your location on the day of testing.

Intermittent Erratic Running/Rough Idle

BASELINE/INTERMITTENT READINGS CHART

BREAKOUT BOX KEYPOINTS	KEY ON/ ENGINE OFF	CRANKING	AT IDLE	TROUBLE POINT*	**
Battery Voltage (BATT)					
Reference Voltage (VREF)					
Throttle Position Sensor (TPS)					
Profile Ignition Pickup (PIP)					
Engine Coolant Temperature (ECT)					
Air Charge Temperature (ACT)					
Spark Output (SPOUT)					
Fuel Pump (FP)					

*At trouble point, i.e., jerks, bucks at 30 mph, etc.
**This column can be used as required.