

VOLVO

FUEL INJECTION

FAULT TRACING

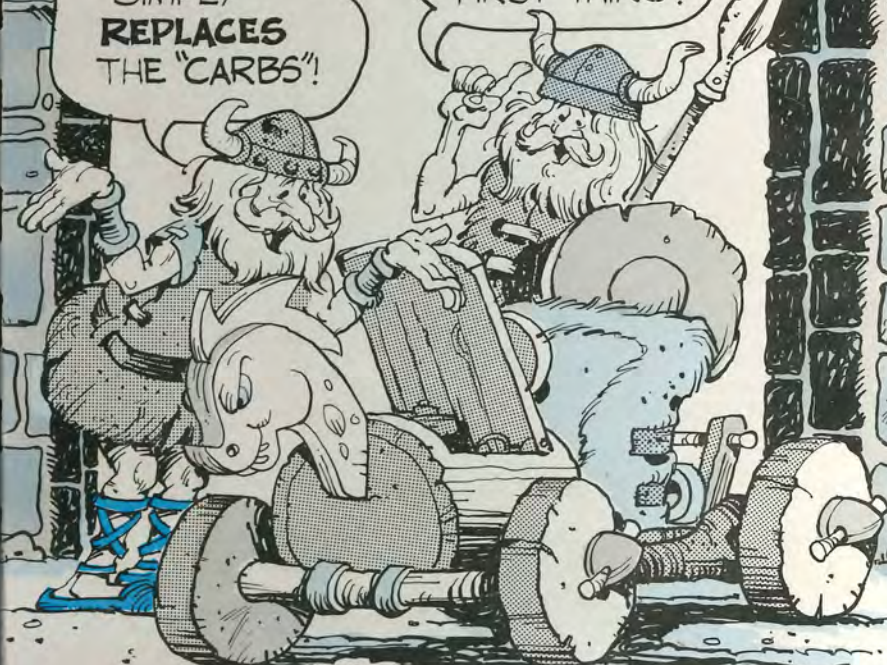
I. HOW TO USE THIS BOOK

II. COMMON TESTERS

III. BOSCH TESTER

WOW! FUEL
INJECTION
SIMPLY
REPLACES
THE "CARBS"!

NOW YOU
MUST CHECK
VALVES,
COMPRESSION,
AND IGNITION
SYSTEM
FIRST THING!



Produced By:

Volvo of America Corporation

NATIONAL SERVICE SCHOOL
Fuel Industrial Park
Rockleigh, N.J. 07647

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FAULT TRACING WITH COMMON TESTERS

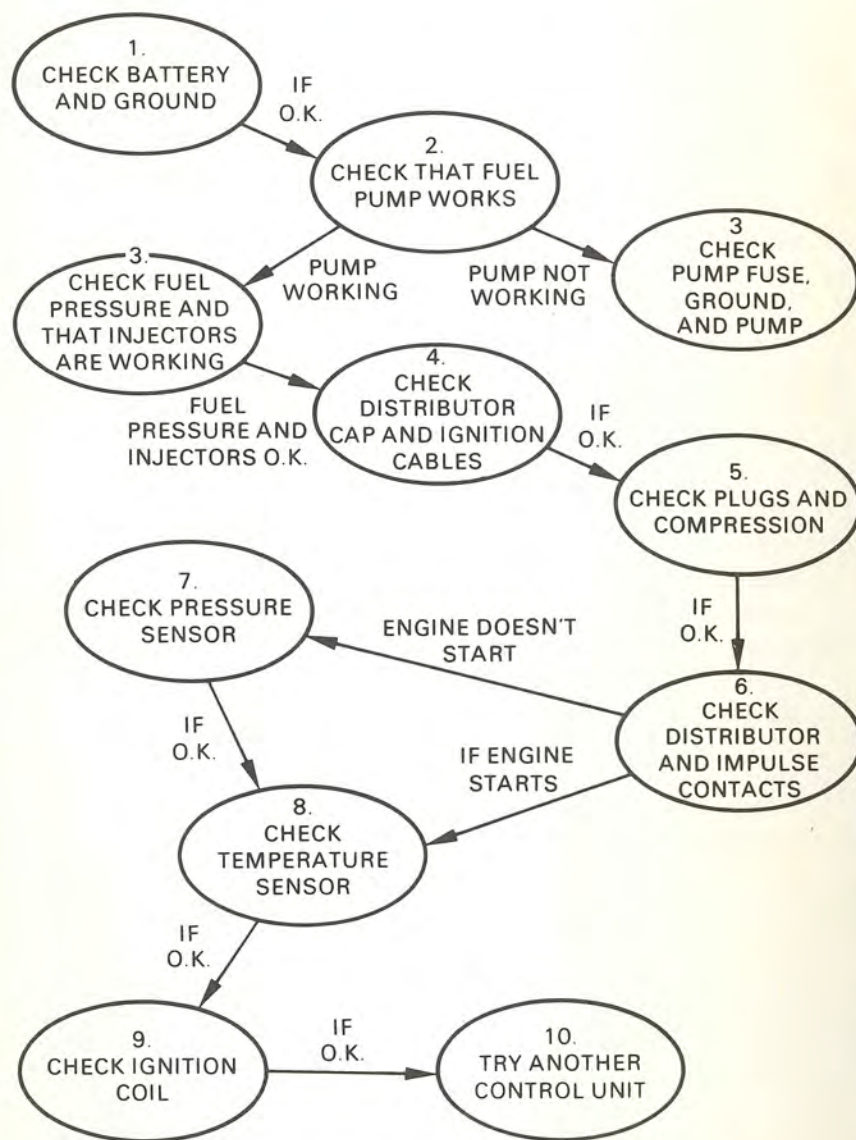
SECTION 2

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PRECAUTIONS WHEN TROUBLESHOOTING FUEL INJECTION SYSTEM.

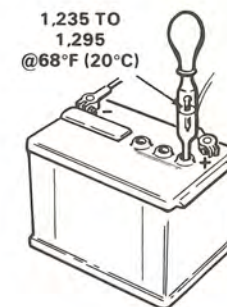
1. Be sure battery is connected when running engine.
2. Never use a "hot shot" or a 24-volt starting device as a starting aid.
3. Disconnect battery when using a "hot shot" (high-speed) battery charger.
4. Do not subject the control unit to temperatures above 185°F. The engine should not be started in temperatures above 158°F. (Push car from baking oven.)
5. Ignition switch should be OFF when connecting or disconnecting computer or connecting meter.
6. Do not allow dirt to enter disconnected fuel lines. Even very small particles can clog injectors.

COLD ENGINE DIFFICULT TO START (WILL NOT START)



COLD ENGINE DIFFICULT TO START (WILL NOT START)

- 1.a. Test the battery charge with hydrometer. If the battery is low, check the charging system. If it is OK, go to b.



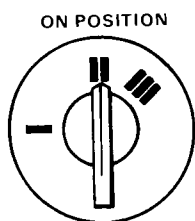
VX1

- b. Make sure the ground connections are clean and tight at the battery bracket, fly-wheel casing, and for B20 engines, induction manifold. Be sure all cables are tight in the electronic system cable terminals. Tighten if necessary, otherwise go to 2.



V72

- 2.a. Sit in car, close windows, switch on ignition. Listen if fuel pump runs for about 1 to 2 seconds. If it runs, go on to 3. If it does not run, go on to b.



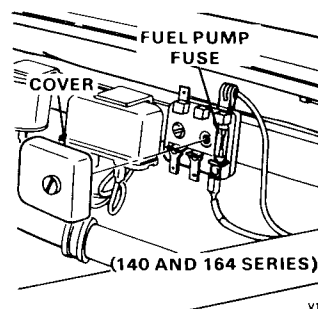
IGNITION SWITCH

V8

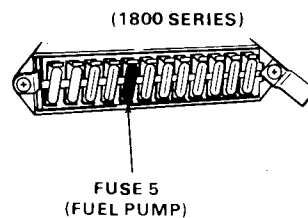


VX2

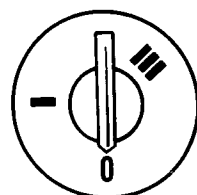
- b. Check that pump fuse is OK and clean. Replace or clean, if necessary. If fuse is OK, go on to c.



V19



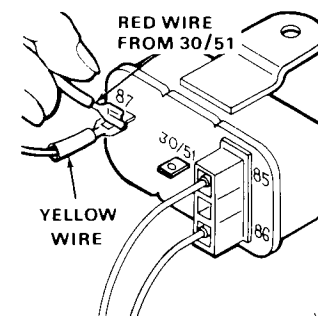
V18



IGNITION SWITCH

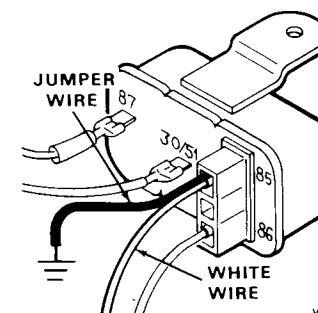
V1

- c. Disconnect the red lead from pump relay terminal 30/51 and hold it against the yellow lead on relay terminal 87. If the pump does not start, go to j. If the pump starts, go to d. Reconnect the red lead to terminal 30/51.



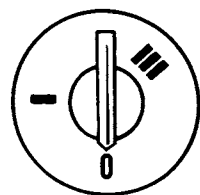
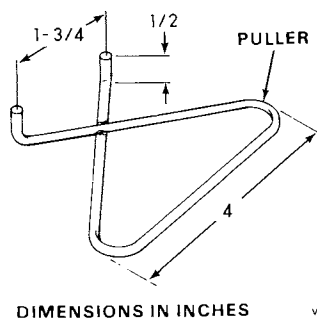
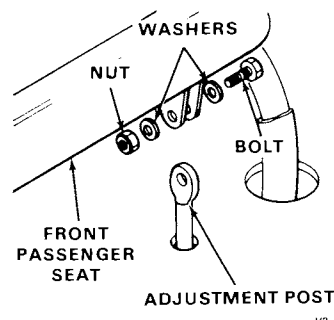
V22

- d. Take a lead and connect it between pump relay terminal 85 and ground. If the relay clicks and the pump starts, go on to e. If the relay clicks and the pump does not start, replace the pump relay. If the relay does not click, go on to f.



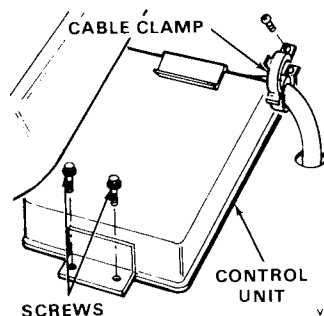
V21

- e. Get another control unit. Temporarily connect the cable harness to it. Turn-on the ignition. If the pump runs, install the new control unit. If the pump does not start, check that cable 19 in the electronic cable harness is properly connected in the contact at the control unit and

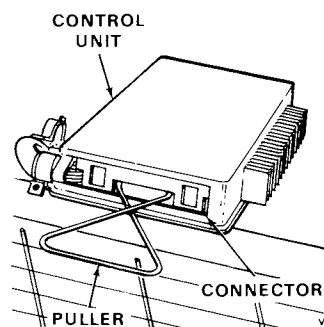


IGNITION SWITCH

V1

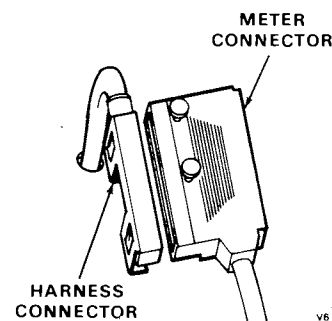


V3

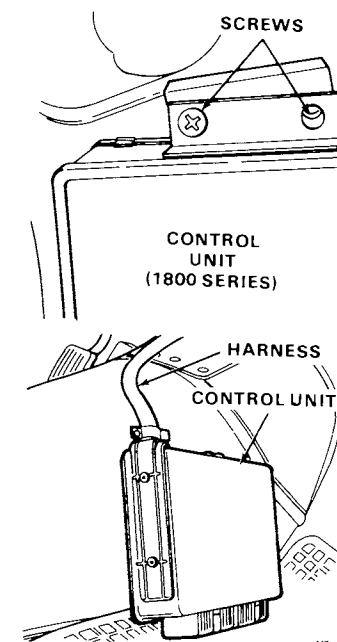


V5

pump relay. Make sure the cable harness is not damaged. Repair any faulty terminals or replace the cable harness.

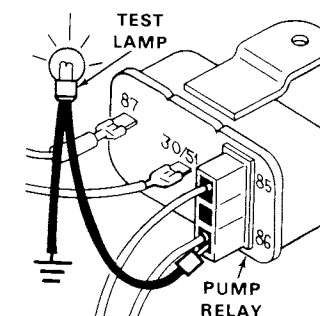


V6



V7

- f. Connect a test lamp between terminal 86 on the pump relay and ground. If the lamp lights, replace the relay. If the lamp does not light, go on to g.



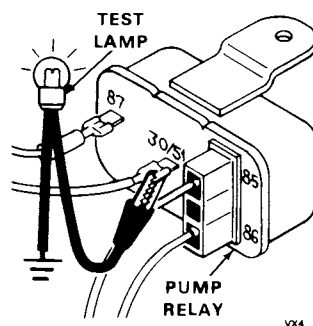
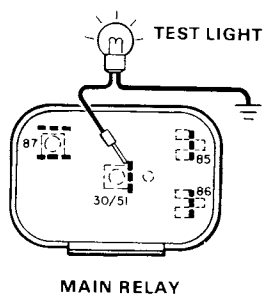
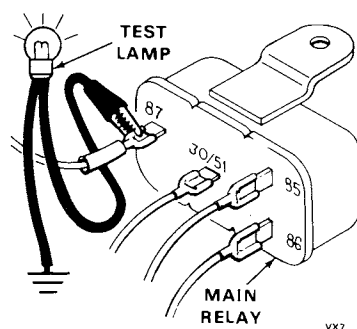
Vx3

- g. Connect the test lamp between terminal 87 on the main relay and ground. If the lamp lights, repair the lead between main relay terminal 87 and pump relay terminal 86. If the lamp does not light, go on to h.

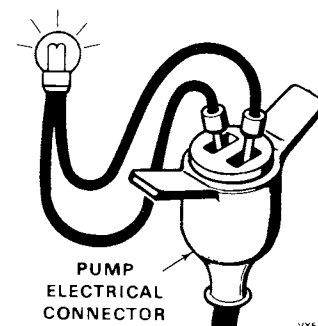
- h. Connect the test lamp between terminal 86 on the main relay and ground. If the lamp lights, go on to i. If the lamp does not light, repair the lead from terminal 86 to the ignition coil on B20 engines or the inhibitor resistor on B30 engines.

- i. Connect the test lamp between terminal 30/51 on the main relay and ground. If the lamp lights, replace the main relay. If it does not light, repair the lead between relay terminal 30/51 and the connector at the battery.

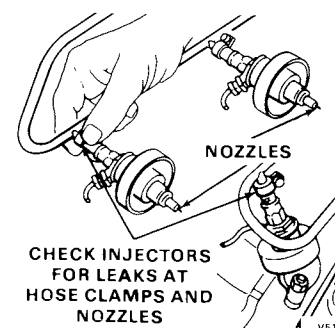
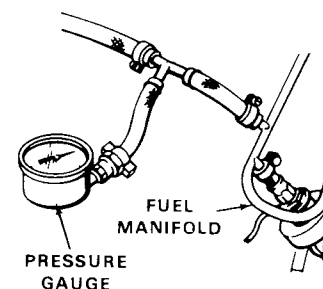
- j. Connect a test lamp between terminal 30/51 on the pump relay and ground. If the lamp lights, go to k. If it does not light, repair the lead between terminal 30/51 and the pump fuse or between the pump fuse and the connector at the battery.



- k. Connect a starter switch to plus on the battery and terminal 50 on the starter motor. Get under the car. Disconnect the electrical contact from the fuel pump. Connect the test lamp to the electrical contact and turn on the starter switch. If the lamp lights up bright, replace the fuel pump. If it does not light, or only lights weakly, repair the lead between the pump relay and pump or between the pump and ground.

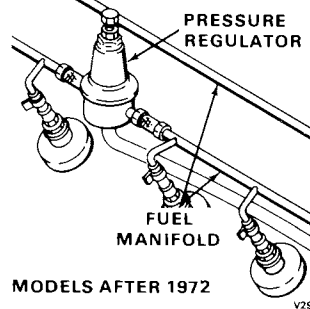
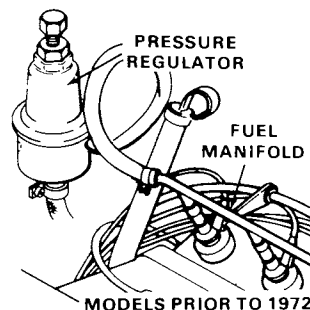
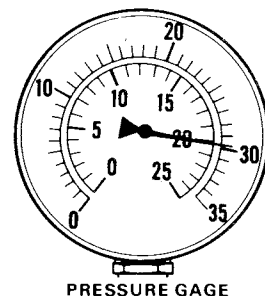
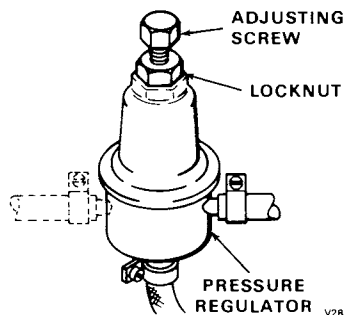


- 3.a. Disconnect the hose to the cold start valve from the fuel manifold. Connect a fuel pressure gauge with a T-piece to the distribution manifold and the hose to the cold start valve. Remove the injectors from the cylinder head. Remove the cold start valve from the induction manifold. Place containers below the injectors to catch fuel sprayed from the injectors. Connect a starter switch to positive on the battery and to terminal 50 on the starter. Turn on the starter. Turn on the starter switch.

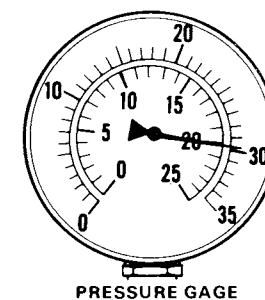


Make sure all injectors and the cold start eject fuel and that the fuel pressure is **29.8 pds/sq. in. (2.1 Kp/Cm²)** on 140 models or **31.3 pds/sq. in. (2.2 Kp/Cm²)** on 160 models. If the injectors eject fuel and the pressure is correct, go to 4. If the fuel pressure is too high, go on to b. If the fuel pressure is too low, go on to d. If the valves do not eject, go on to g.

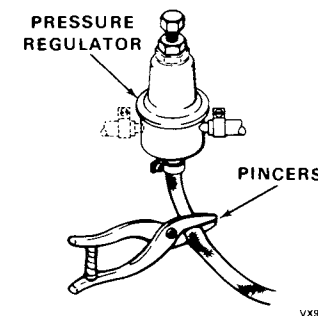
- b. Loosen the locknut on the pressure regulator. Turn on the starter switch. Adjust the pressure to **29.8 pds/sq. in. (2.1 Kp/Cm²)** on 140 models or **31.3 pds/sq. in. (2.2 Kp/Cm²)** on 160 models with the adjuster screw.



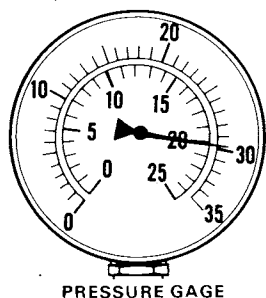
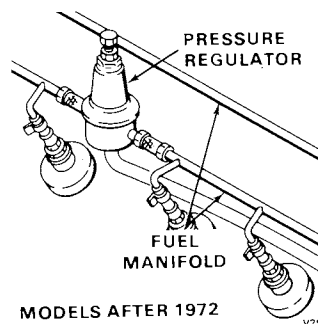
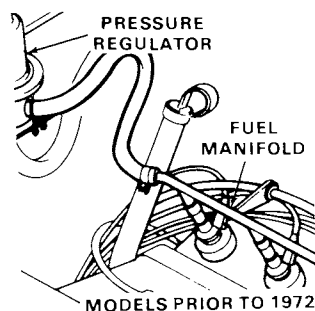
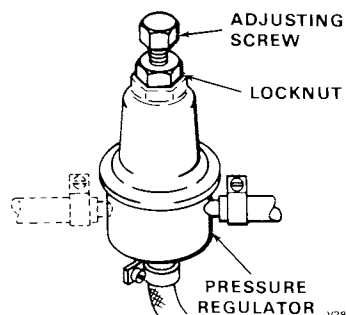
Tighten the locknut. If the pressure cannot be adjusted, go on to c.



- c. Make sure the return line to the tank is not blocked or pinched. If the line is blocked or damaged, clean or replace it. If the line is OK, replace the pressure regulator.
- d. Turn on the starter switch. Watch the fuel pressure gauge while compressing the return line from the pressure regulator with pincer 9992901. If the pressure rises to about **64 pds/sq. in. (4.5 Kp/Cm²)** go to f. If the pressure does not rise, go to e.
- e. Make sure that the fuel lines and fuel filter are not blocked. If the filter is blocked, replace it. If the lines are blocked, clean or replace them. If the filter and lines are OK, replace the pump.



- f. Loosen the locknut on the pressure regulator. Turn on the ignition switch. Adjust the pressure to **29.8 pds/sq. in. (2.1 Kp/Cm²)** on 140 models or **31.3 pds/sq. in. (2.2 Kp/Cm²)** on 160 models with the adjuster screw. Tighten the adjuster screw. If the pressure cannot be adjusted, replace the regulator.



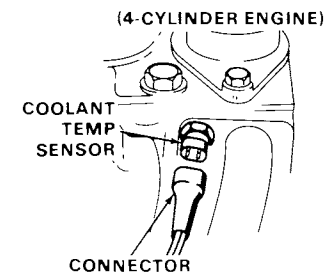
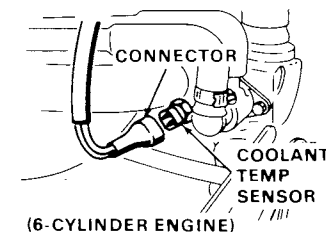
V48

- g. If the cold start valve on 1971 model cars and earlier does not eject, go on to h. If the cold valve on 1972 model cars and later does not eject, go on to o. If all the injectors in one injection group (cyl 1, 3, and 5 and 2, 4, and 6 respectively) do not eject, go on to s. If one or two injectors do not eject, go to t.

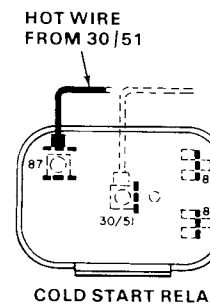
- h. Disconnect the electrical contact to the coolant temperature sensor. Turn on the starter switch. If the cold start valve works, go on to i. If it does not work, go on to j.

- i. If the engine is colder than **131°F (55°C)**, replace the coolant temperature sensor. If the engine is warmer, the sensor is working. Go on to 4.

- j. Disconnect the red lead from terminal 30/51 on the cold start relay. Hold it against terminal 87. Turn on the starter switch. If the valve does not work, go on to k. If it does work, go on to m.

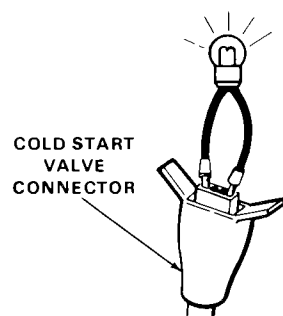


V89

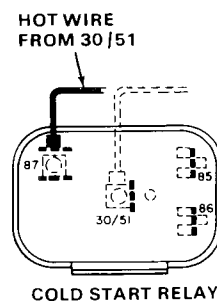
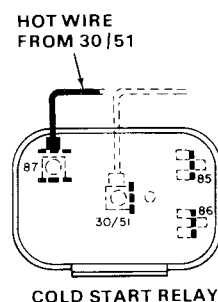
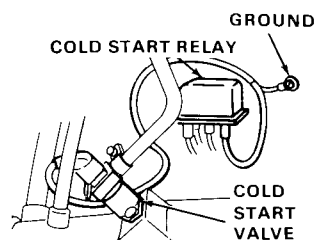


V80

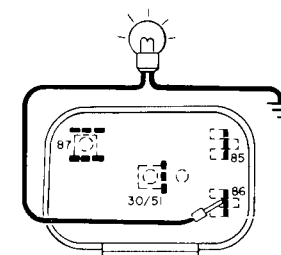
- k. Disconnect the electrical contact on the cold start valve. Connect a test lamp to the connection. Hold the red lead from cold start relay terminal 30/51 against relay terminal 87. If the lamp lights, replace the cold start valve. If it does not light, go on to l.



- l. Connect the test lamp between earth and lead 34 terminal in the contact at the cold start valve. Hold the red lead from cold start relay terminal 30/51 against relay terminal 87. If the lamp lights, repair lead 33 from the cold start valve contact to the injection harness ground on the manifold for the B20 engine and at the battery bracket for B30 engines. If the lamp does not light, repair lead 34 between the valve electrical contact and terminal 87 on the cold start relay.

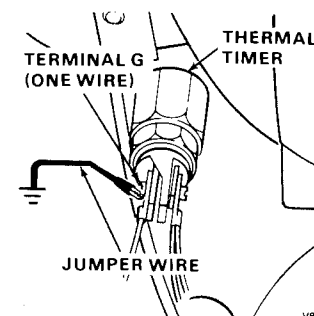


- m. Connect a test lamp between ground and terminal 86 on the cold start relay. Turn on the starter switch. If the lamp lights, go to n. If it does not light, repair lead 29 between relay terminal 86 and terminal 50 on the starter.

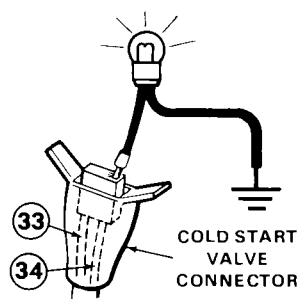
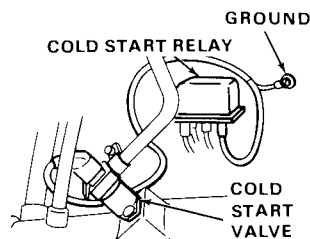


- n. Connect a lead between cold start relay terminal 85 and ground. Turn the starter switch. If the valve works, replace the control unit. If it does not work, change the cold start relay.

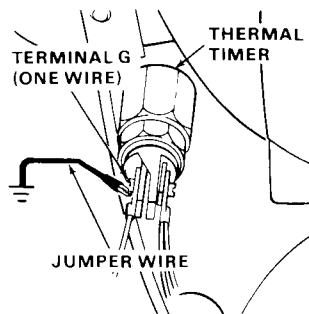
- o. Disconnect lead 33 from the thin pin on the thermo-time sensor and ground the lead. Turn on the starter switch. If the valve does not work, go to p. If it works, go to r.



- p. Disconnect the electrical connector from the cold start valve. Connect a test lamp between ground and terminal 34 in the cold start valve connector. Turn on the starter switch. If the lamp lights, go to q. If it does not light, repair lead 34 from the cold start valve contact via the thick pin on the thermo-time sensor to starter terminal 50.

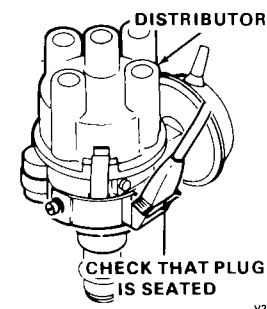


- q. Connect the test lamp between the two terminals in the cold start valve contact. Ground lead 33 at the thermo-time sensor. Turn on the starter switch. If the lamp lights, replace the cold start valve. If it does not light, repair lead 33 between the cold start valve and the thermo-time sensor.

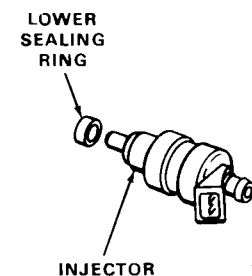
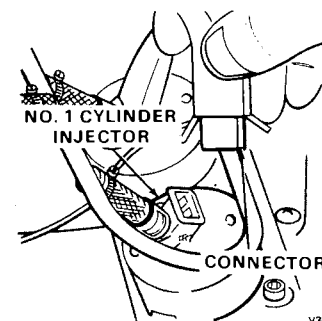


- r. If the engine is colder than **95°F (35°C)**, replace the thermo-time sensor. If it is warmer than **95°F (35°C)**, let it cool off and then go to a.

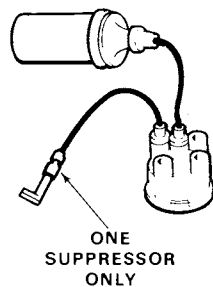
- s. Make sure the leads to the impulse contacts and the terminal contacts in the distributor are OK and have clean terminals. Fix any defects you may find. If contacts are OK, go to 6.



- t. Make sure the leads and terminals for the faulty injector are OK. Repair any defects you may find. If no faults are found, replace the injector.



- 4.a. Remove the distributor cap with ignition cables and rotor. Clean the ignition cables and the outside of the cap. Wipe the inside of the cap with a clean rag. Make sure the distributor cap and rotor are not cracked, and that there are no burned terminals. Make sure the center brush is free. Make sure the insulation on the ignition cables is undamaged and the suppressors and sealing caps are OK. Make sure there is only one suppressor on each cable. Replace damaged parts. Remove excessive suppressors. If no faults are found, go on to 5.



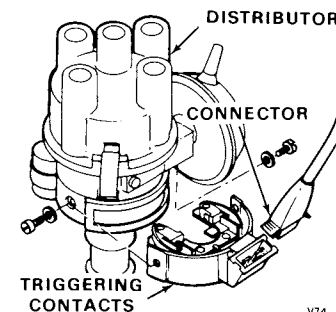
VX13

- 5.a. Remove the spark plugs. Check that they are not burned or choked with carbon. Check the heat rating. Replace faulty plugs. Check the compression. If no faults are found, go to 6.



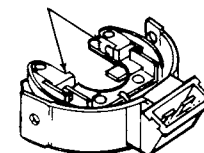
VX14

- 6.a. Remove the distributor. Unscrew the impulse contacts and clean them with tv contact cleaner. Feel if the contacts stick. Make sure the leads are not loose in the contact. Lubricate the contacts sparingly. If no faults are found, go to b.



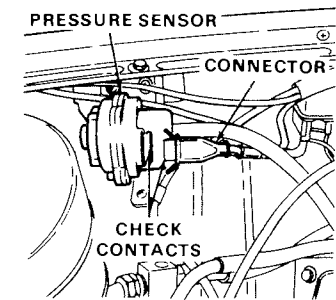
V74

CLEAN AND
LUBRICATE
HERE



- b. Check that the distributor shaft, breaker cam, or breaker plate are not loose. If OK, go to c.
- c. Check that the breaker points are not burned. Check for capacitor leakage with an ohmmeter. If OK, go to d.
- d. Lubricate the distributor and reinstall it. Adjust dwell angle and timing. If the engine does not start, go to 7. If the engine starts but runs rough, go to 8.

- 7.a. Disconnect the electrical connector from the pressure sensor. Connect the ohmmeter to the outer pins (7 and 15). If the resistance is **90** ohms, go on to b. If the resistance is less than **90** ohms, replace the pressure sensor.

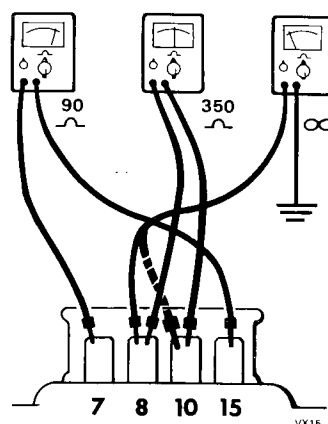


V50

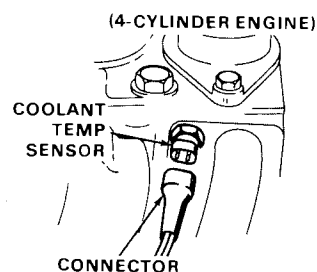
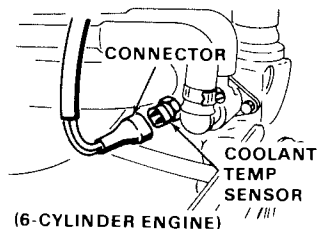
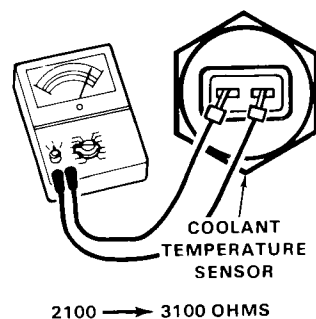
- b. Connect the ohmmeter to the center pins (8 and 10). If the resistance is **350 ohms**, go to c. If it is less than **350 ohms**, replace the pressure sensor.

- c. Connect the ohmmeter to pin 7 or 15 and the pressure sensor casing. If the resistance is ∞ , go to d. If it is not infinite, replace the pressure sensor.

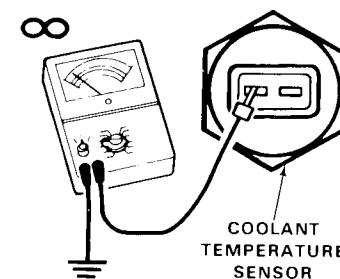
- d. Connect the ohmmeter to pin 8 or 10 and to the pressure sensor casing. If the resistance is ∞ , go to 8. If it is not infinite, replace the pressure sensor.



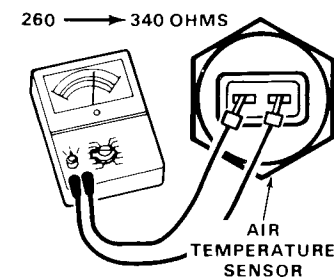
- 8.a. Remove the electrical contact from the coolant temperature sensor. Connect an ohmmeter between the two pins. If resistance with a cold engine is between **2100** and **3100 ohms**, go on to b. If not, replace the temperature sensor.



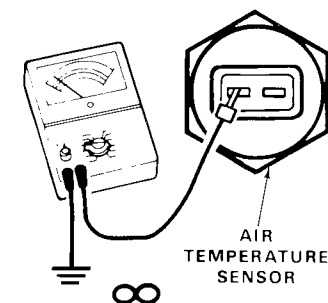
- b. Connect the ohmmeter to one of the pins and ground. If the resistance is ∞ , go to c. If not, replace the coolant temperature sensor.



- c. Remove the electrical contact from the induction air temperature sensor. Connect the ohmmeter between the two pins. If the resistance is between **260** and **340 ohms** with a cold engine, go to d, if not, replace the air temperature sensor.

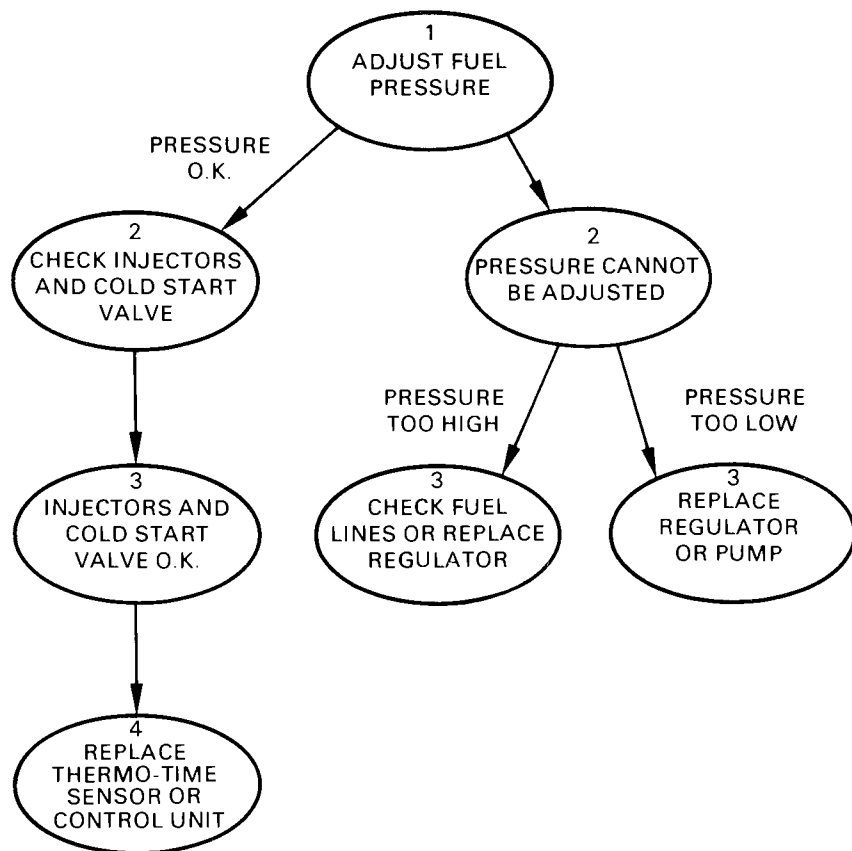


- d. Connect the ohmmeter to one of the pins and ground. If the resistance is ∞ , go to 9. If not, replace the air temperature sensor.



- 9.a. If a fault still remains, it can be the ignition coil, wiring, or control unit.

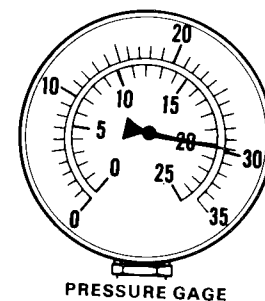
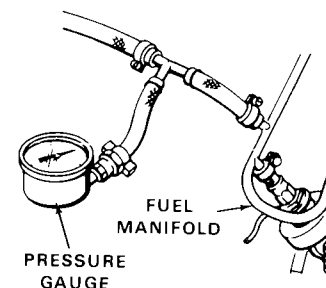
WARM ENGINE DIFFICULT TO START (OR RE-START)



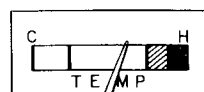
WARM ENGINE DIFFICULT TO START (RE-START).

1. If the engine is still difficult to start when it has cooled down, go to section 1, if not, go on to step 2.

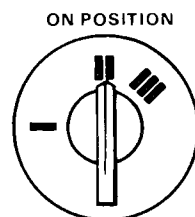
- 2.a. Disconnect the hose between the cold start valve and the fuel distribution manifold. Connect a fuel pressure gauge with a T-piece to the distribution manifold and the hose. Start the engine. Adjust the fuel pressure to **29.8 pds/sq. in. (2.1 Kp/Cm²)** on 140 models or **31.3 pds/sq. in. (2.2 Kp/Cm²)** on 160 models. If the pressure cannot be adjusted, go on to c. If the pressure is OK, go to b.



- b. Disconnect the leads from starter motor terminal 50. Connect a starter switch between the leads and the positive terminal on the battery. When the engine temperature reaches about **176°F (80°C)**, switch off engine. Leave the ignition on. Remove the injectors from the cylinder head. Remove the cold start valve from the induction manifold. Put a pan under the valves to collect fuel. Turn on the ignition switch. If more than 5 drops a minute leak from the injectors, replace them. If the cold start valve leaks, go to g.



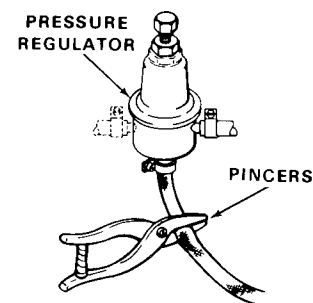
APPROX 175°



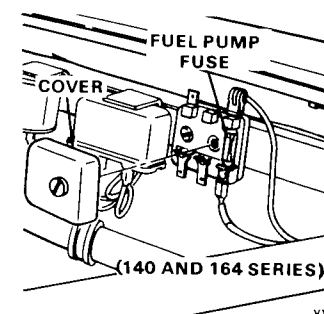
IGNITION SWITCH

- c. If the fuel pressure is over **29.8 pds/sq. in. (2.1 Kp/Cm²)** on 140 models or **31.3 pds/sq. in. (2.2 Kp/Cm²)** on 160 models, go on to d. If it is less, go on to e.
- d. Check if the fuel line to the tank is blocked or damaged. If blocked, clean it or replace it. If not blocked or damaged, replace the pressure regulator.

- e. Clip pincer 9992901 on the fuel return line. Turn on the ignition switch. Watch the fuel pressure gauge. If the pressure goes up to about **64 pds/sq. in. (4.5 Kp/Cm²)**, replace the pressure regulator. If the pressure does not rise, go to f.



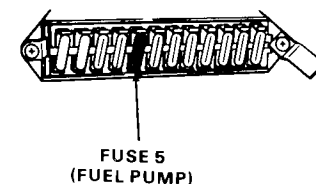
- f. Make sure the pump fuse is not blown or corroded and the pump is grounded. If OK, replace the pump.



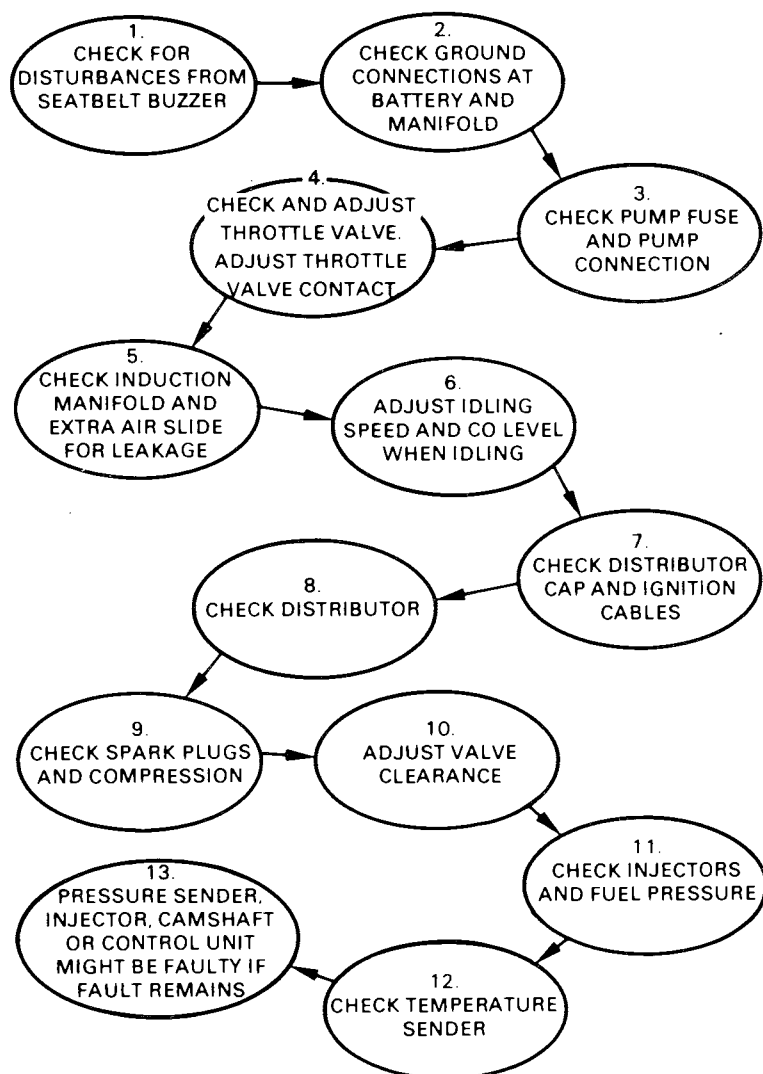
- g. Disconnect the electrical contact from the cold start valve. Turn on the starter switch. If the cold start valve ejects fuel, replace it. If it does not eject fuel, replace the thermo-time sensor if the car is a 1972 model or later. If it is a 1971 model or earlier, go to h.

(1800 SERIES)

- h. Disconnect the electrical contact at terminals 85 and 86 on the cold start relay. Turn on the starter switch. If the cold start valve ejects fuel, replace the relay. If it does not, replace the control unit.



ENGINE RUNS ROUGH



NOTE:
WHEN PROCEEDING IN ACCORDANCE WITH STEPS AFTER STEP 6 YOU MUST ADJUST THE IDLING AND CO AS INSTRUCTED IN STEP 6

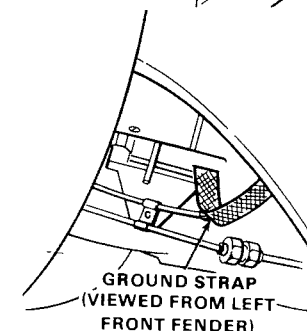
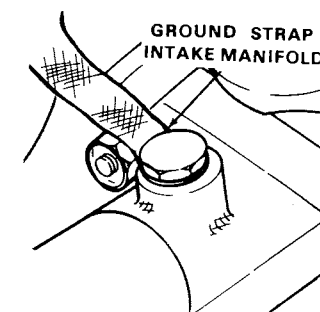
ENGINE RUNS ROUGH

1. Start the engine. Operate seat belt buzzer. If engine disturbance occurs, take those steps described in Service Bulletin Group 25 No. 5. If not, go on to b.

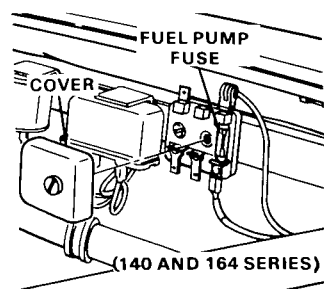
NOTE

The engine can be disturbed by transmissions on a two-way radio, if installed. Go on to 2.

2. Check that the ground connections at the battery bracket and flywheel casing, and at the induction manifold for B20 engines, are clean and tight. Make sure all leads are tight in the electronic system cable terminals. Repair, if necessary. If connections OK, go on to 3.



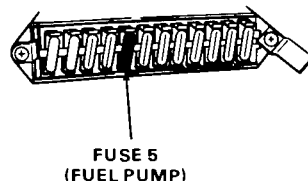
- 3.a. Check if the fuel pump fuse is corroded or dirty. If corroded or dirty, go to b. If it is clean, go on to c.



(1800 SERIES)

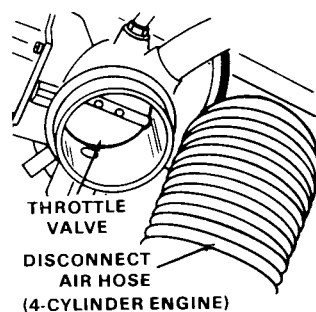
V19

- b. Replace the fuse and clean the fuse holder.
- c. Get under the car and check that the fuel pump ground connection is tight and clean. Repair, if necessary, or go on to 4.

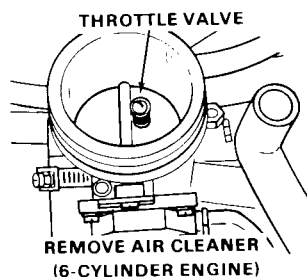


V18

- 4.a. Disconnect the hose from the air cleaner at the induction manifold on the B20. On a B30, remove the air cleaner. Feel if the throttle valve is binding. If the valve sticks, replace the valve. If the valve is loose, tighten it. If valve is OK, go on to b.

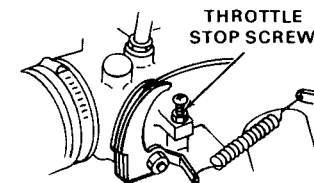


THROTTLE VALVE
DISCONNECT
AIR HOSE
(4-CYLINDER ENGINE)

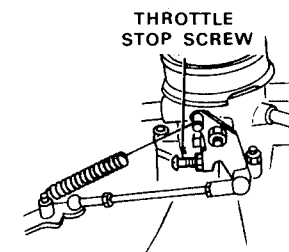


THROTTLE VALVE
REMOVE AIR CLEANER
(6-CYLINDER ENGINE)

- b. Loosen the locknut on the stop screw for the air flap. Back out the screw a couple of turns so it does not touch the shoulder on the flap spindle. Close the flap completely. Screw in the stop screw until it touches the shoulder on the spindle. Then screw it in **one turn** on a B20 engine and **1 1/4 turns** on a B30. Tighten the locknut. Go on to c.

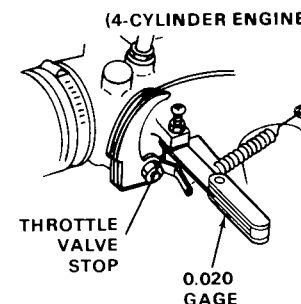
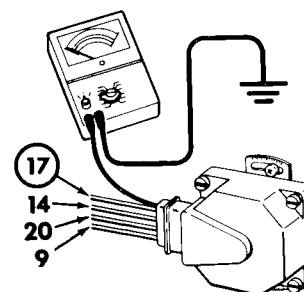


(4-CYLINDER ENGINE)

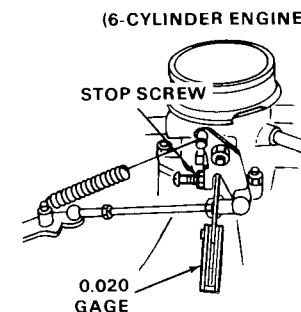


(6-CYLINDER ENGINE)

- c. Insert an **0.020-inch (0.5 mm)** feeler gauge between the shoulder and the stop screw. Connect a voltmeter between terminal 17 on the flap contact and ground. Turn on the ignition. Loosen the retainer screw on the flap contact so you can turn it. Turn the contact counterclockwise to stop. If the voltmeter shows **0V**, go on to d. If it shows above **5V**, replace the flap contact.



(4-CYLINDER ENGINE)



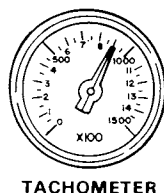
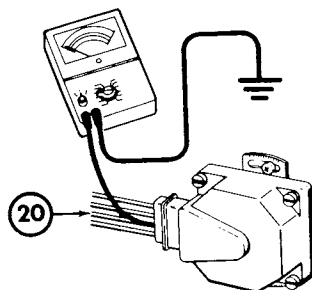
(6-CYLINDER ENGINE)

d. Turn the flap contact clockwise until the voltmeter indicates. Lock the contact exactly where the voltmeter indicates. Go on to 5. If the voltmeter does not indicate, go on to e.

e. Connect the voltmeter between terminal 20 on the flap contact and ground. If there is any voltage, replace the flap contact. If there is no voltage, go to f.

f. Make sure that lead 20 is properly connected at the flap contact and the control unit. If the cable terminals are OK, replace the control unit.

5.a. Connect a starter switch between terminal 50 on the starter motor and the positive terminal on the battery. Connect a tachometer to the engine. Start the engine. Disconnect on the induction manifold, watch the tachometer. If the engine speed does not change, go to c. If it does change, go to b.



TACHOMETER

b. Make sure the induction manifold is not cracked, that it is properly installed, and the stay on the B20 is undamaged and fitted properly. Take any necessary steps.

c. Warm up the engine. Read the engine speed. Disconnect the hose between the induction manifold and the auxiliary air regulator. Hold your hand over the end of the hose. If the engine speed slows down, replace the auxiliary air regulator. If it remains unchanged, go on to 6.

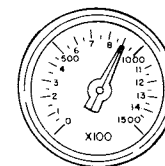
6. Adjust the idling speed, then adjust the CO at idling in accordance with the Vehicle Emission Control information sticker on the firewall.

NOTE

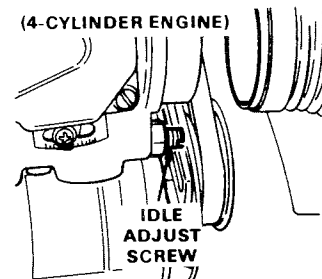
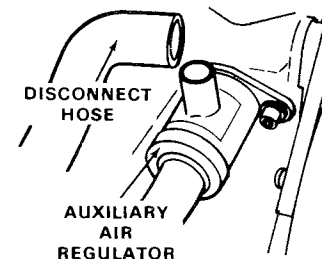
Only on 1972 model cars and later: If you cannot adjust the CO, go on to 10, and then go back to 6. If the engine still runs rough, go on to 7.

CAUTION

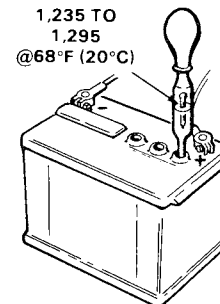
The Vehicle Emission Control Information sticker on the firewall of each vehicle is the top authority for emission control adjustments.



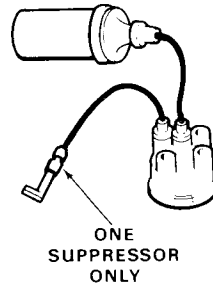
TACHOMETER



1,235 TO
1,295
@68°F (20°C)

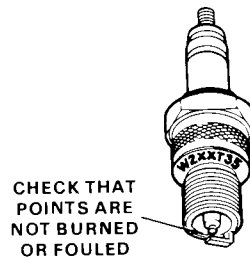


7. Remove the distributor cap with ignition cables and rotor. Clean the ignition cables and the outside of the cap. Wipe the inside of the cap with a clean rag. Make sure the distributor cap and rotor are not cracked, and that there are no burned terminals. Make sure the center brush is free. Make sure the insulation on the ignition cables is undamaged and the suppressors and sealing caps are OK. Make sure there is only one suppressor on each cable. Replace damaged parts. Remove excessive suppressors. If no faults are found, go on to 8.



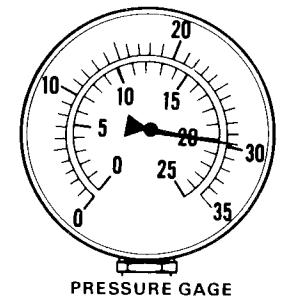
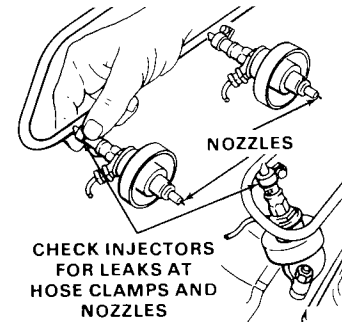
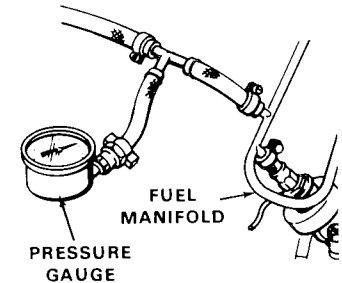
- 8.a. Remove the distributor. Check if the distributor shaft, breaker cam, or breaker are loose. Go on to b.
- b. Check that the breaker points are not burned. Check for capacitor leakage with an ohmmeter.
- c. Lubricate the distributor and reinstall it. Adjust the dwell and timing. If the engine still runs rough, go on to 9.

9. Remove the spark plugs. Check that they are not burned or choked with carbon. Check the heat rating. Replace faulty plugs. Check the compression. If no faults are found, go to 10.

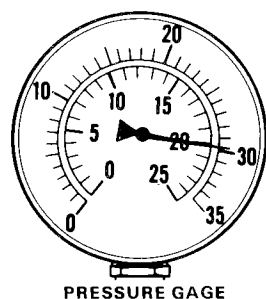
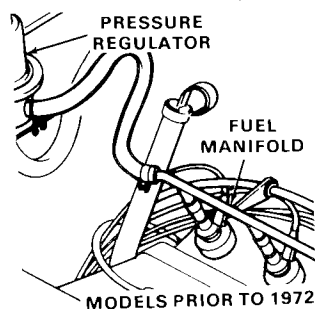


10. Adjust the valve clearance. If the engine still runs rough, go to 11.

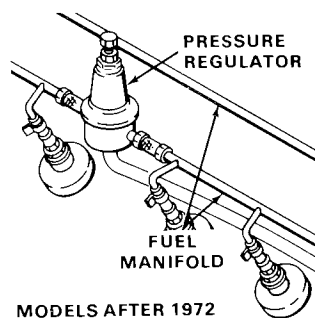
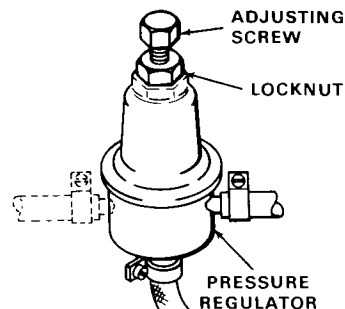
- 11.a. Disconnect the hose to the cold start valve from the fuel manifold. Connect a fuel pressure gauge with a T to the manifold and the hose to the cold start valve. Remove the injection valves from the cylinder head. Place containers below the injectors to catch fuel sprayed from the injectors. Connect a starter switch to positive on the battery and to terminal 50 on the starter. Turn on the starter switch. Check that all the injectors eject fuel and that the fuel pressure is **29.8 pds/sq. in. (2.1 Kp/Cm²)** on 140 models or **31.3 pds/sq. in. (2.2 Kp/Cm²)** on 160 models. If the injectors are working and the pressure is OK, go on to 11h. If the fuel pressure is too high, go onto b. If is too low, go on to d. If the valves are not ejecting, go onto g.



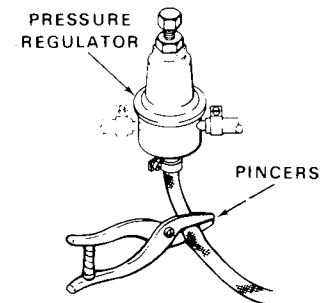
- b. Loosen the locknut on the pressure regulator. Turn on the starter switch. Adjust the pressure to **29.8 pds/sq. in. (2.1 Kp/Cm²)** on 140 models or **31.3 pds/sq. in. (2.2 Kp/Cm²)** on 160 models with the adjuster screw. Tighten the locknut. If the pressure cannot be adjusted, go to c.



- c. Make sure the return line to the tank is not blocked or pinched. If the line is blocked or damaged, clean or replace it. If the line is OK, replace the pressure regulator.

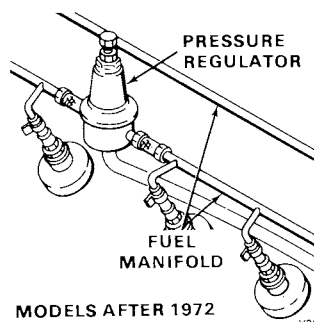
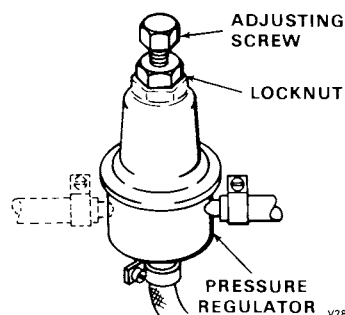
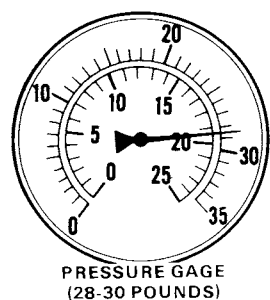
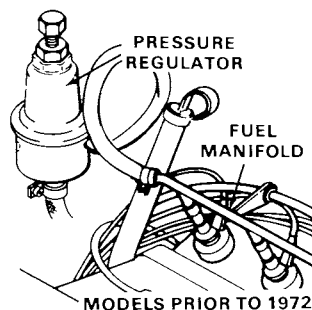


- d. Turn on the starter switch. Watch the fuel pressure gauge while compressing the return line from the pressure regulator with pincer 9992901. If the pressure rises to about **64 pds/sq. in. (4.5 Kp/Cm²)**, go to f. If the pressure does not rise, go to e.

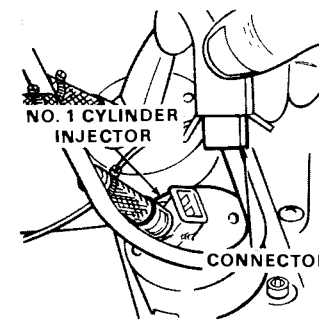
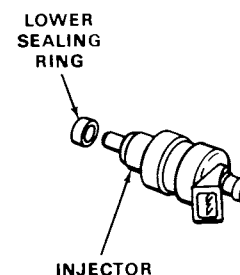


- e. Make sure that the fuel lines and fuel filter are not blocked. If the filter is blocked, replace it. If the lines are blocked, clean or replace them. If the filter and lines are OK, replace the pump.

- f. Loosen the locknut on the pressure regulator. Turn on the ignition switch. Adjust the pressure to **29.8 pds/sq. in. (2.1 Kp/Cm²)** on 140 models or **31.3 pds/sq. in. (2.2 Kp/Cm²)** on 160 models with the adjuster screw. Tighten the adjuster screw. If the pressure cannot be adjusted, replace the regulator.

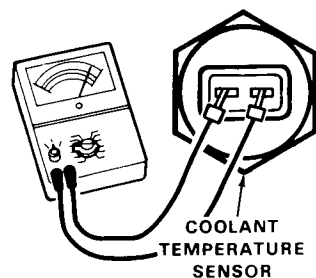


- g. Make sure that the leads and connections for the faulty injectors are OK. Repair any defects. If no defects are found, replace the injector.



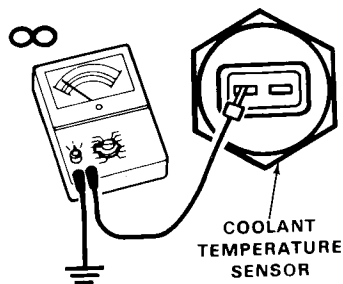
- h. Disconnect the leads terminal 50 on the starter motor. Disconnect the electrical contact from the cold start valve. If the cold start valve drips fuel, replace it. If an injector leaks more than 5 drops a minute, replace it. If all valves are OK, go to 12.

- 12.a. Remove the electrical contact from the coolant temperature sensor. Connect an ohmmeter between the two pins. If resistance with a cold engine is between **2100** and **3100** ohms, go to b. If not, replace the temperature sensor.

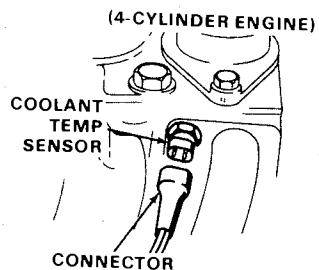
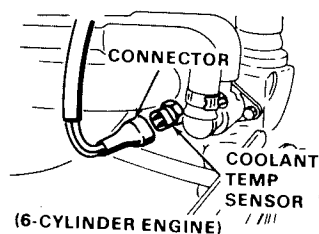


2100 → 3100 OHMS

- b. Connect the ohmmeter to one of the pins and ground. If the resistance is infinite, go to c. If not, replace the coolant temperature sensor.

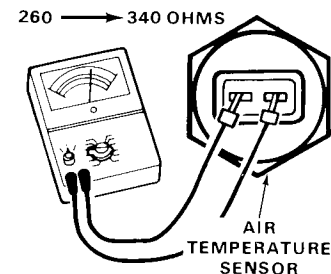


VX17



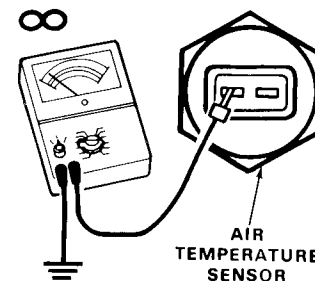
V89

- c. Remove the electrical contact from the induction air temperature sensor. Connect the ohmmeter between the two pins. If the resistance is between **260** and **340** ohms with a cold engine, go to d, if not replace the air temperature sensor.



VX18

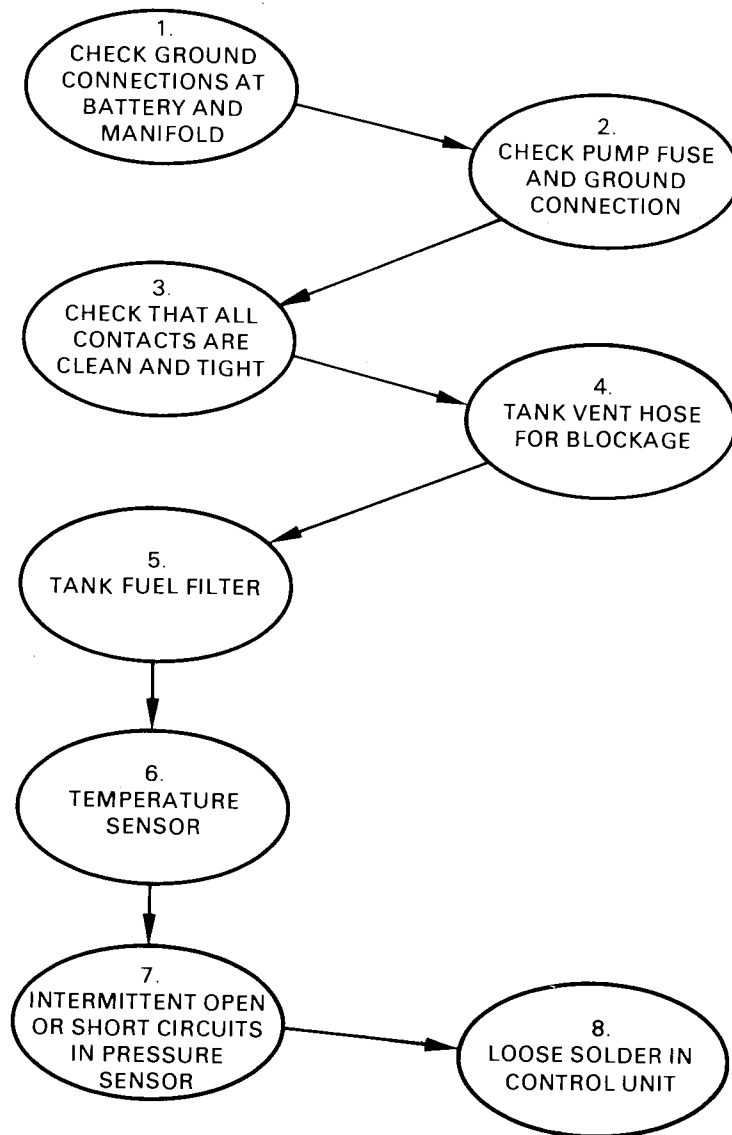
- d. Connect the ohmmeter to one of the pins and ground. If the resistance is ∞ , go to 13, if not, replace the air temperature sensor.



VX19

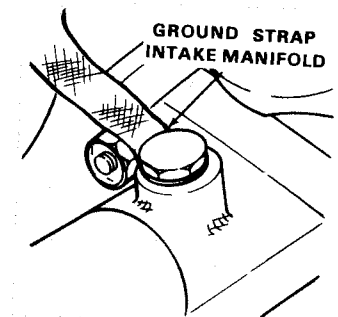
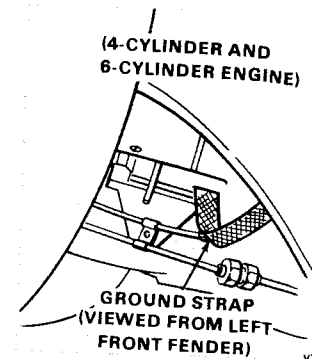
13. If the engine still runs unevenly the fault can be a sticking pressure sensor, sticking injectors, worn camshaft, faulty control unit, or electrical leads.

ENGINE STALLS INTERMITTENTLY



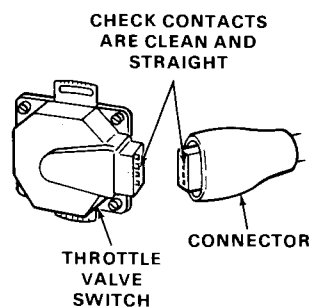
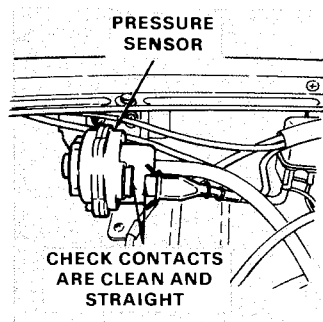
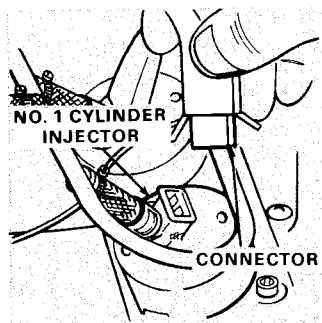
ENGINE STALLS INTERMITTENTLY

1. Make sure the ground connections are clean and tight at the battery and, on the B20, on the induction manifold.



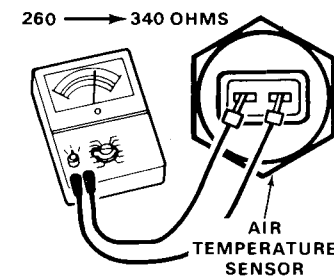
- 2.a. Check if the fuel pump fuse is corroded or dirty. If dirty, go to b. If it is clean, go to c.
- b. Replace the fuse and clean the fuse holder.
- c. Get under the car and check that the fuel pump ground connection is tight and clean. Repair any defects or if clean and tight, go to 3.

3. Ensure that all contacts are tight and clean and that the leads are secure in the contact pieces. Tighten and clean any loose leads or contacts. If there are no defects, go to 4.



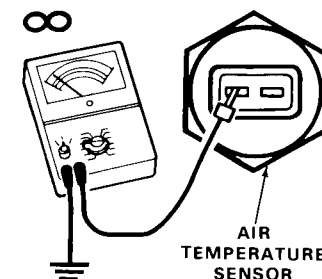
4. Remove the tank air-vent hose and blow it out with air. Re-fit the hose and make sure it does not get pinched. If the hose was not pinched or blocked, go to 5.
5. Drain the fuel from the tank. Dismantle the strainer. If the strainer is dirty, clean it. If damaged, replace it. If the strainer is clean and undamaged, go to 6.

- 6.a. Remove the electrical contact from the coolant temperature sensor. Connect an ohmmeter between the two pins. If the resistance with a cold engine is between 2100 and 3100 ohms, go to b. If not, replace the temperature sensor.



VX18

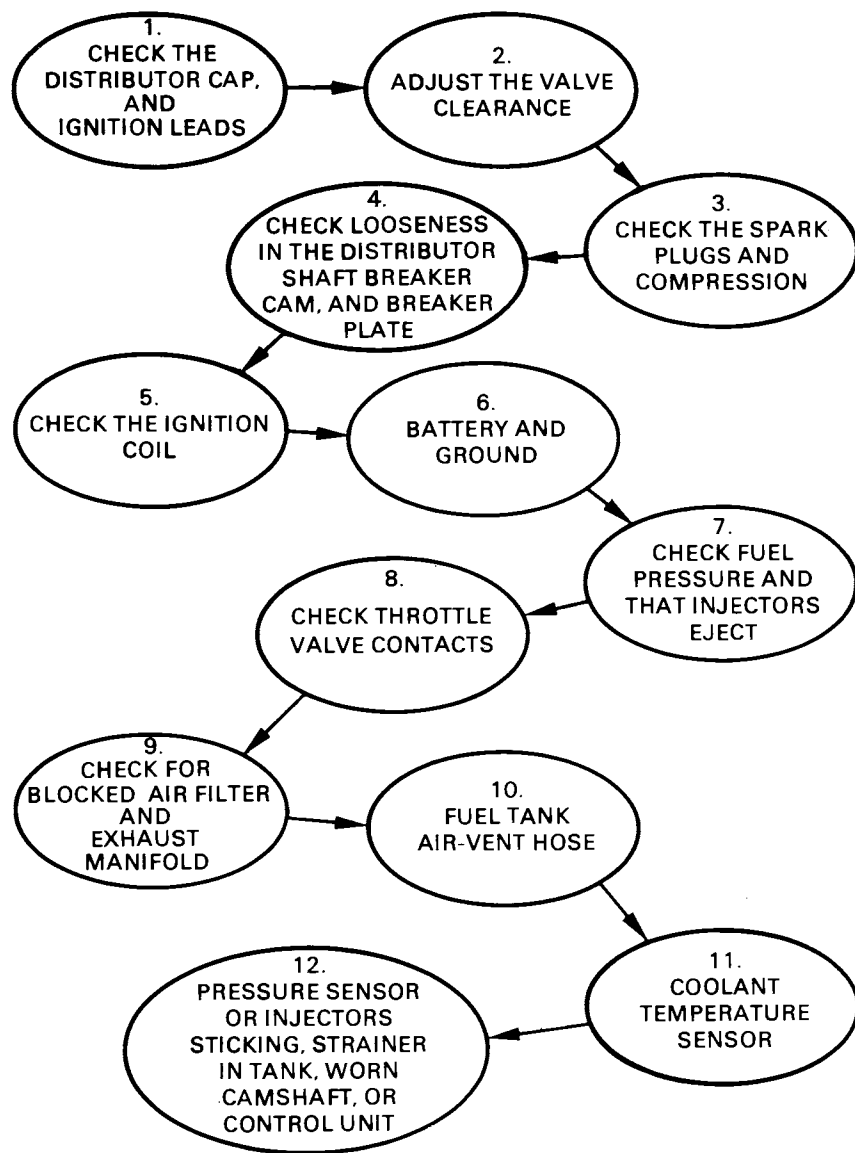
- b. Connect the ohmmeter to one of the pins and to ground. If the resistance is infinite, go to 7. If it is not infinite, replace the temperature sensor.



VX17

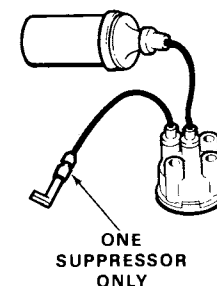
7. Remove the control unit, but do not disconnect the electrical contact. Start the engine. Knock each side of the control unit lightly with a rubber hammer. If the engine dies or jumps, replace the control unit. If not, go to 8.
8. If the fault remains, replace the pressure sensor. If trouble still remains, check the ignition system.

LOW TOP SPEED AND LOW POWER



LOW TOP SPEED AND LOW POWER

- 1.a. Remove the distributor cap with ignition cables and rotor. Clean the ignition cables and the outside of the cap. Wipe the inside of the cap with a clean rag.
- b. Make sure the distributor cap and rotor are not cracked, and that there are no burned terminals.
- c. Make sure the center brush is free.
- d. Make sure the insulation on the ignition cables is undamaged and that the suppressors and sealing caps are OK.
- e. Make sure there is only one suppressor on each cable.
- f. Replace damaged parts. If no faults are found, go to 2.
2. Adjust the valve clearance. If OK, go to 3.
3. Connect a starter switch to starter motor terminal 50 and to positive terminal on battery.



- b. Remove the spark plugs. Check that they are not burned or choked with carbon. Check that the proper plug is installed. Replace faulty plugs.

CHECK THAT
POINTS ARE
NOT BURNED
OR FOULED



- c. Check compression.
- d. If no defects are found, go to 4.

- 4.a. Remove the distributor. Check if the distributor shaft, breaker cam, or breaker points are loose. If OK, go on to b.

- b. Check that the breaker points are not burned. Check for capacitor leakage with an ohmmeter.

- c. Lubricate the distributor and reinstall it. Adjust dwell and timing.

- d. If the engine is still weak, go to 5.

- 5.a. Remove ignition wire about 1/4-inch (6.3 millimeters) from ignition coil. Switch on. Turn starter switch. Check for strong blue spark at coil. If spark strong, go to 6. If spark orange and weak or no spark, go to b.



- b. Connect a voltmeter between the positive terminals on the ignition coil and the battery. Switch on. If the meter indicates more than 0.5 V for B20 and more than 4.5 V for B30 go to c. If not, replace the ignition coil.

- c. Clean the terminals and make sure the leads between the ignition coil, inhibitor resistor on B30, ignition switch, starter motor, and battery are undamaged. Repair or replace any defective parts. Re-check the readings according to b. If the voltage is still too high, go to d. for the B30 or e. for the B20.

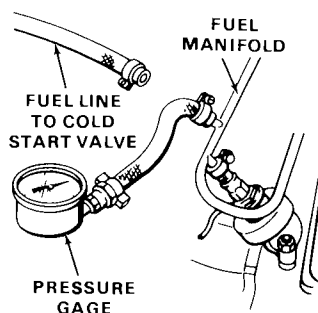
- d. Switch on. Connect the voltmeter across the inhibitor resistor. If the voltage is less than 4V, go on to e. If it is more than 4 V, replace the inhibitor resistor.

- e. Connect a voltmeter between ignition switch terminals 15 and 30. If the voltage is more than 0.3 V, replace the ignition switch.

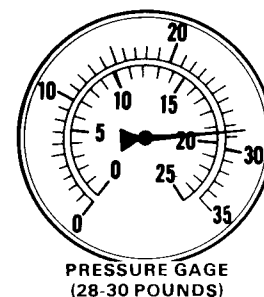
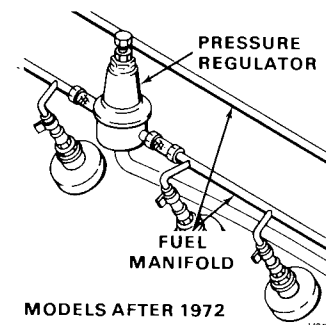
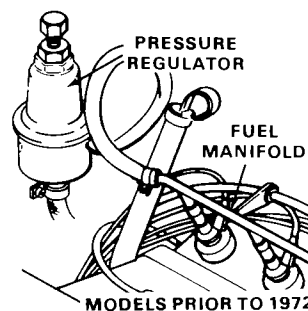
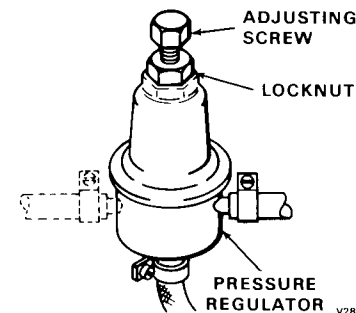
- 6.a. Test the battery charge with a hydrometer. If the battery is low, check the charging system. If the battery is OK, go to b.

- b. Make sure the ground connections are clean and tight at the battery, flywheel casing, and for B20 engines, at the induction manifold. Be sure all cables are tight in the electronic system cable terminals. Tighten, if necessary, otherwise go to 7.

- 7.a. Disconnect the hose between the cold start valve and the distribution manifold. Connect a fuel pressure gauge to the distribution manifold. Remove the injectors from the cylinder head. Place a container below the injectors to catch sprayed fuel. Switch on. Check that all injectors are ejecting and the fuel pressure is **29.8 pds/sq. in. (2.1 Kp/Cm²)** on 140 models or **31.3 pds/sq. in. (2.2 Kp/Cm²)** on 160 models. If the injectors are working and the pressure is correct, go on to 8. If the fuel pressure is too high, go to b. If it is too low, go to d. If the injectors are not working, go to g.

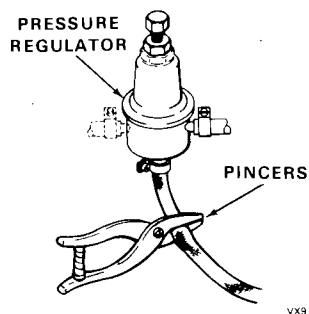


- b. Loosen the locknut on the pressure regulator. Turn on the ignition switch. Adjust the pressure to **29.8 pds/sq. in. (2.1 Kp/Cm²)** on 140 models or **31.3 pds/sq. in. (2.2 Kp/Cm²)** on 160 models with the adjuster screw. Tighten the locknut. If the pressure cannot be adjusted, go to c.



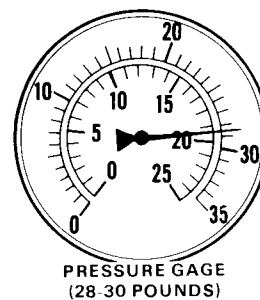
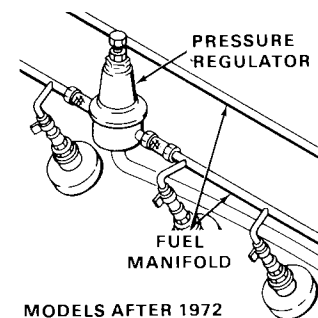
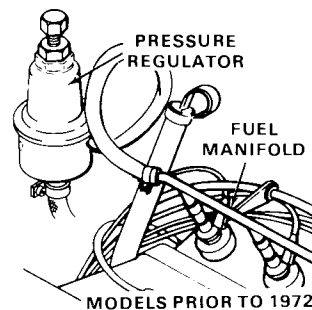
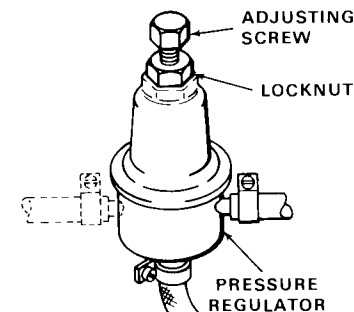
c. Make sure the return line to the tank is not blocked or pinched. If the line is blocked or damaged, clean or replace it. If the line is OK, replace the pressure regulator.

d. Turn on the ignition switch. Watch the fuel pressure gauge. Pinch the return line from the pressure regulator with pincer 9992901. If the pressure rises to about **64 pds/sq. in. (4.5 Kp/Cm²)**, go to f. If the pressure does not rise, go to e.



e. Make sure the fuel lines and fuel filter are not blocked. If the filter is blocked, replace it. If the lines are blocked, clean or replace them. If the filter and lines are OK, replace the pump.

- f. Loosen the locknut on the pressure regulator. Turn on the ignition switch. Adjust the pressure to **29.8 pds/sq. in. (2.1 Kp/Cm²)** on 140 models or **31.3 pds/sq. in. (2.2 Kp/Cm²)** on 160 models with the adjuster screw. Tighten the adjuster screw. If the pressure cannot be adjusted, replace the regulator.
- g. Make sure the leads and terminals for the faulty injectors are OK. Repair any defects. If no faults are found, replace the injector.



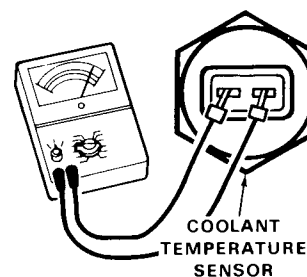
- 8.a. Open the throttle slowly until it is fully open. If you hear 20 clicks while opening the throttle, go to b. If you do not hear any clicks, replace the throttle contacts.
 - b. Close the throttle from full open. If you do not hear any clicks, go to 9. If you do hear clicks, replace the throttle contact.
- 9.a. Check if the air filter is blocked. If the filter is blocked or has been used for over 25,000 miles (40,000 Km), replace it. If the filter is clean go to b.

NOTE

The air filter should be changed every 25,000 miles (40,000 Km.)

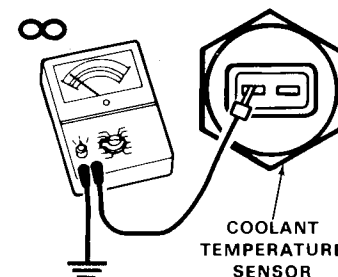
- b. Check the exhaust pipe. If it is blocked or pinched, replace the damaged section. If the exhaust pipe is OK, go on to 10.
10. Remove the tank air-vent hose and blow it out with air. Reinstall the hose. Make sure it is not pinched. If the hose was not pinched or blocked, go to 11.

- 11.a. Remove the electrical contact from the coolant temperature sensor. Connect an ohmmeter between the two pins. If the resistance with a cold engine temperature is between **2100** and **3100** ohms, go to b. If not, replace the temperature sensor.



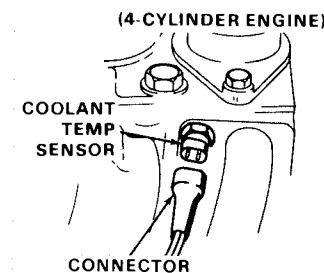
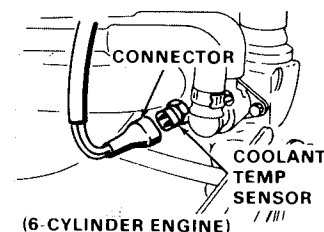
2100 → 3100 OHMS

- b. Connect the ohmmeter to one of the pins and ground. If the resistance is infinite, go to 12. If not, replace the coolant temperature sensor.

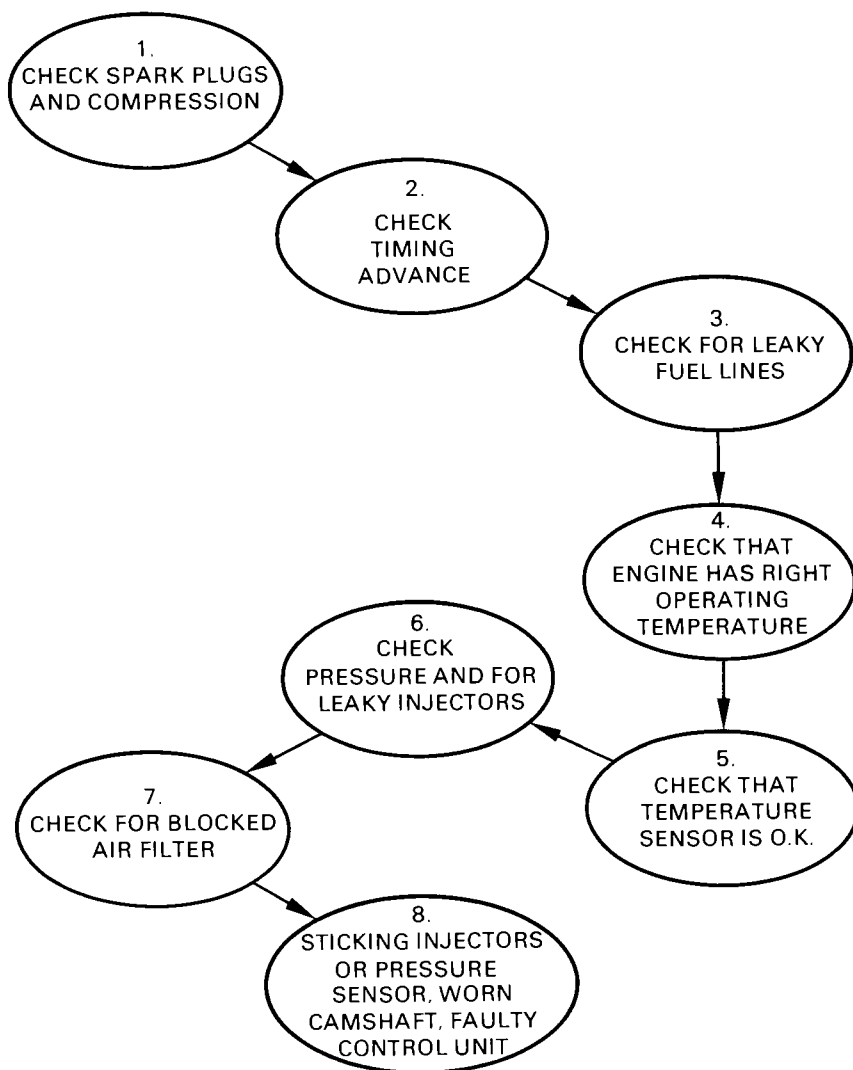


VX17

12. If the engine is still weak, replace pressure regulator. If still weak, replace control unit. If no improvement, check for sticking injectors, a blocked fuel strainer, or a worn cam shaft.

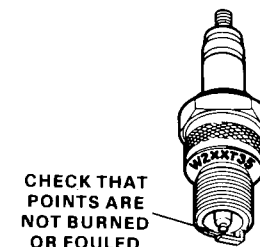


HIGH FUEL CONSUMPTION



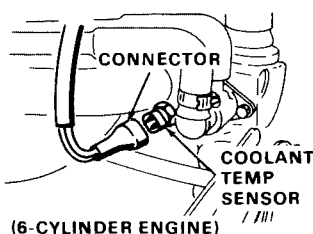
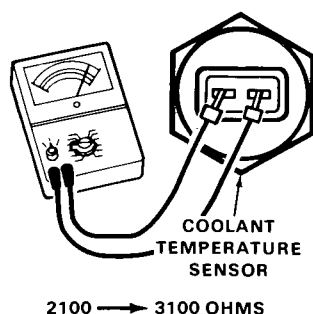
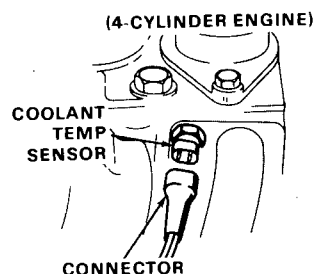
HIGH FUEL CONSUMPTION

1. Remove the spark plugs. Check that they are not burned or choked with carbon. Check the plug number. Replace faulty plugs. Check the compression. If no faults are found, go to 2.
2. Check the timing and the vacuum and centrifugal advance of the distributor. If the timing is wrong, adjust it. If the ignition advance is defective, rebuild the distributor. If no faults are discovered, go to 3.
3. Check for any fuel line leaks. If any are leaking, replace the damaged parts and seal them. If they are not leaking, go to 4.
4. Start the engine and warm it up. Check that the engine temperature is about **175°**. If not, replace the thermostat. If it has the right temperature, go to 5.

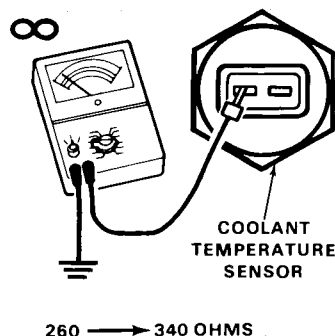


APPROX 175°

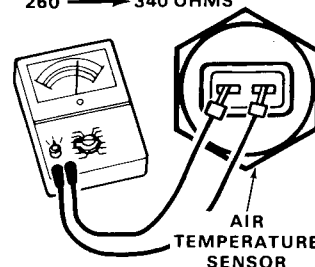
- 5.a. Remove the electrical contact from the coolant temperature sensor. Connect an ohmmeter between the two pins. If resistance with a cold engine is between **2100** and **3100**, go to b. If not, replace the temperature sensor.



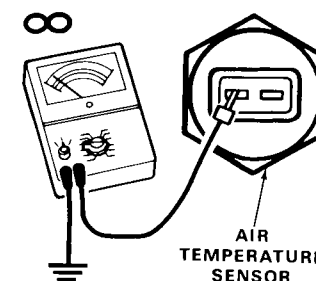
- b. Connect the ohmmeter to one of the pins and ground. If the resistance is infinite, go to c. If not, replace the coolant temperature sensor.



- c. Remove the electrical contact from the induction air temperature sensor. Connect the ohmmeter between the two pins. If the resistance is between **260** and **340** ohms cold engine, go to d. If not, replace the air temperature sensor.

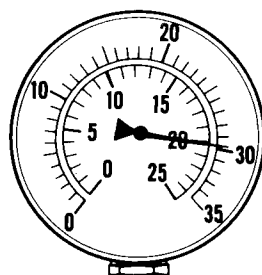
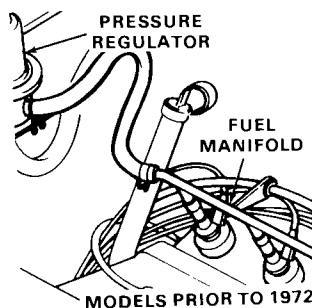


- d. Connect the ohmmeter to one of the pins and ground. If the resistance is infinite, go to 6. If not, replace the air temperature sensor.



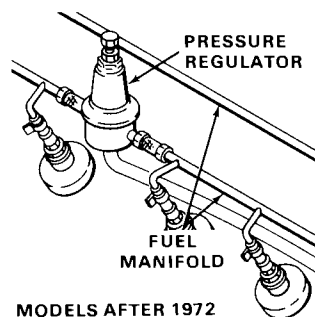
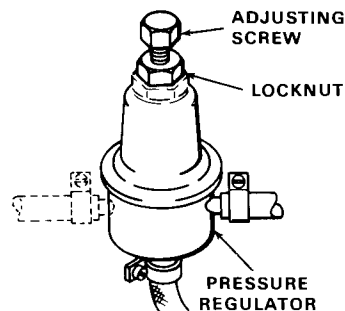
- 6.a. Disconnect the hose between the cold start valve and the distribution manifold. Connect a fuel pressure gauge with a T-piece to the distribution manifold and the hose to the cold start valve. Remove the injectors from the cylinder head and the cold start valve from the induction manifold. Place a container under the injectors to catch sprayed fuel. Disconnect the cables from terminal 50 on the starter motor. Connect the starter switch to the cables and the positive terminal on the battery. Switch on ignition and starter switch. Make sure the fuel pressure is **29.8 pds/sq. in. (2.1 Kp/Cm²)** on 140 models or **31.3 pds/sq. in. (2.2 Kp/Cm²)** on 160 models and the injectors do not leak more than 5 drops a minute, and the cold start valve does not leak. If the fuel pressure is too high, go to b. If it is too low, go to d. If the injectors leak too much, replace them. If the cold start valve leaks, replace it. If the cold start valve ejects, go to g. If no faults appear, go to 7.

- b. Loosen the locknut on the pressure regulator. Turn the starter switch. Adjust the pressure to **29.8 pds/sq. in. (2.1 Kp/Cm²)** on 140 models or **31.3 pds/sq. in. (2.2 Kp/Cm²)** on 160 models with the adjuster screw. Tighten the locknut. If the pressure cannot be adjusted, go on to c.



PRESSURE GAGE

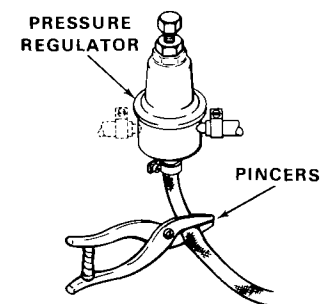
V48



MODELS AFTER 1972

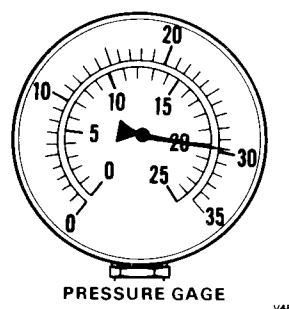
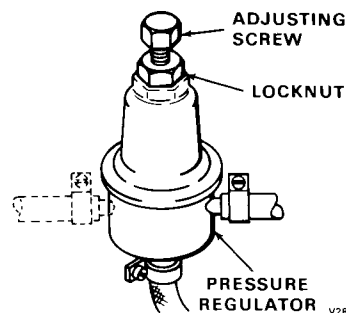
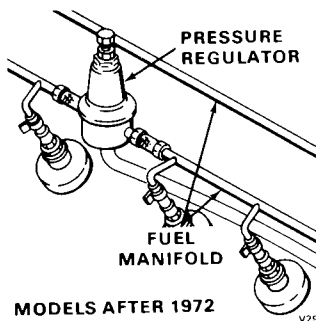
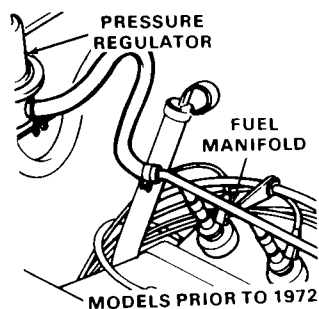
- c. Make sure the return line to the tank is not blocked or pinched. If the line is blocked or damaged, clean or replace it. If the line is OK, replace the pressure regulator.

- d. Turn on the starter switch. Watch the fuel pressure gauge while compressing the return line from the pressure regulator with pincer 9992901. If the pressure rises to about **64 pds/sq. in. (4.5 kp/Cm²)**, go to e.



- e. Make sure that the fuel lines and fuel filter are not blocked. If the filter is blocked, replace it. If the lines are blocked, clean or replace them. If the filter and lines are OK, replace the pump.

- f. Loosen the locknut on the pressure regulator. Turn on the ignition switch. Adjust the pressure to **29.8 pds/sq. in. (2.1 Kp/Cm²)** on 140 models or **31.3 pds/sq. in. (2.2 Kp/Cm²)** on 160 models with the adjuster screw. Tighten the adjuster screw. If the pressure cannot be adjusted, replace the regulator.



- g. Disconnect the electrical contact from the cold start valve. Turn on the starter switch. If the cold start valve ejects fuel, replace it. If it does not eject fuel, replace the thermo-time sensor if the car is a 1972 model or later. If it is a 1971 model or earlier, go to h.
- h. Disconnect the electrical contact at terminals 85 and 86 on the cold start relay. Turn on the starter switch. If the cold start valve ejects fuel, replace the relay. If it does not, replace the control unit.
7. Make sure that the air filter is not blocked. If the filter is blocked or has been used for more than 25,000 miles (40,000 Km), replace it. If the filter is clean, go to 8.

NOTE

The air filter should be changed every 25,000 miles (40,000 Km).

8. If no fault is found, it is possibly sticking injectors or pressure sensor, a worn camshaft, or a faulty computer.

FAULT TRACING WITH BOSCH TESTER

SECTION 3

*Turn to
page*

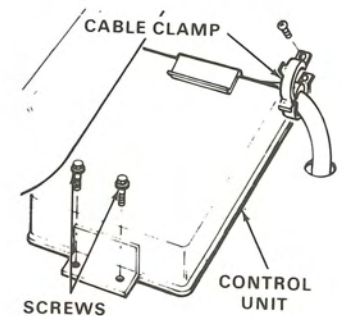
Connecting Bosch Tester to Control Unit	3-3
Engine Will Not Run (May Start But Stops)	3-6
Engine Runs Rough	3-20
Engine Cuts Out (Misfires) When Driving	3-32
Engine Does Not Have Enough Power	3-35
Fuel Consumption Too High	3-40
Engine Hunts Between 1,000 and 1,700 RPM at Idle (Models prior to 1972 only)	3-46
Engine Misfires When Accelerating	3-48
Engine Idles Too Fast and Cannot be Adjusted Down	3-52
Engine Will Not Accelerate Above Idle (Pedal Feels Loose)	3-56
Engine Difficult To Start When Cold (O.K. When Hot)	3-58

CONNECTING BOSCH TESTER TO CONTROL UNIT

The Bosch Tester is used to check wiring and the electrical components of the fuel injection system. It measures voltages and resistance at various points in the system. The tester will not detect defects in the mechanical parts of electrical components. For example, if the transformer plunger in the pressure sensor is binding, it will not be detected by the tester. Connect the tester to the control unit as follows:

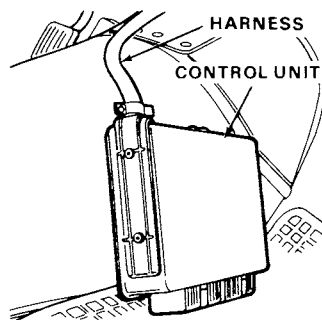
On 142E and 164E, go to step 1. On 1800E, go to step 2.

- 1.a. Be sure ignition switch is off.
- b. Remove cushion from passengers front seat by opening four snap fasteners.
- c. Remove bolt, nut, and washers from front seat adjustment post. Unscrew adjustment post.
- d. Remove two screws from control unit bracket. Slip control unit from holder and from under seat.



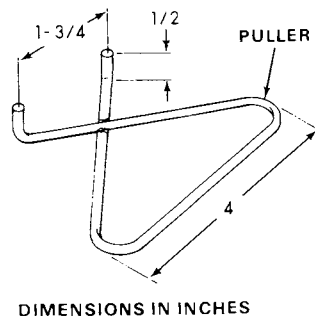
- e. Remove screw from cable clamp.

- 2.a. Remove heat duct from in front of control unit, under passengers dash board.
- b. Remove two screws from top of control unit.
- c. Remove control unit from bracket.

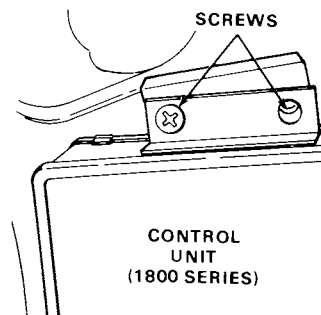


- d. Go to step 3.

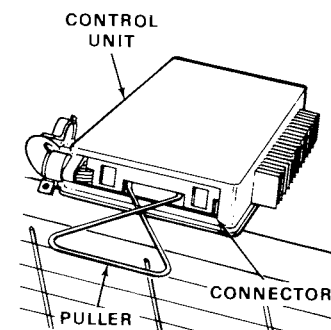
- 3.a. Make puller from coat hanger or welding rod.



DIMENSIONS IN INCHES



- b. Hook puller under plastic connector and pull connector from control unit.
- c. Go to step 4.



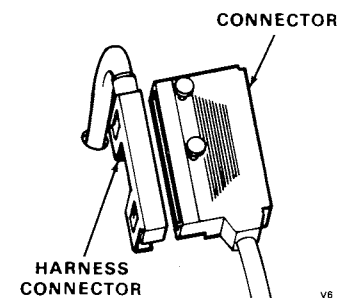
4. Insert connector from text box into car harness connector.

NOTE

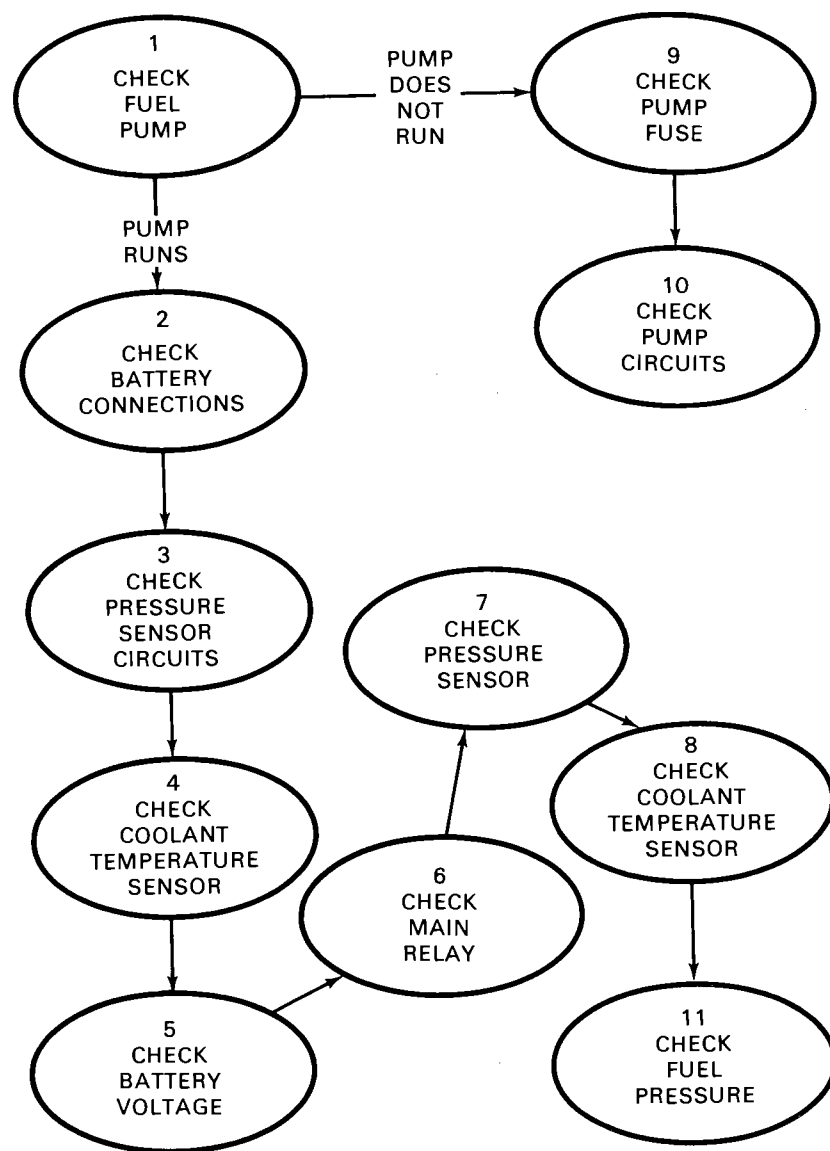
Do not connect test box connector to control unit unless instructed to do so in steps.

CAUTION

Do not force the plug of the tester into the harness plug or the control unit. Damage to the plug or control unit may result.



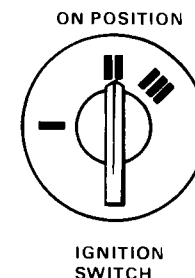
ENGINE WILL NOT RUN (MAY START BUT STOPS)



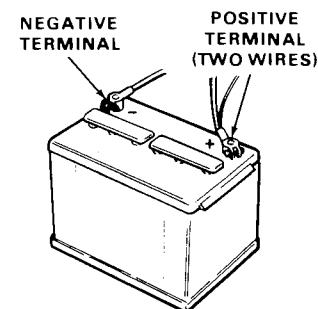
ENGINE WILL NOT RUN (MAY START BUT STOPS)

- 1.a. Close windows. Turn on ignition. Listen for fuel pump running (for about 2 seconds).

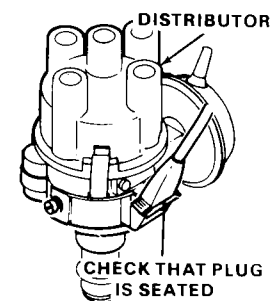
- b. If fuel pump doesn't run, go to step 9. If pump runs, go to step 2.



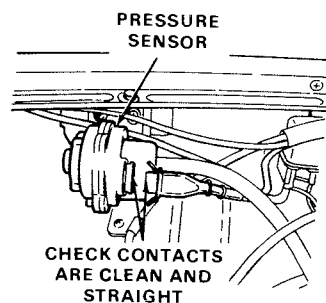
- 2.a. Open hood. Check that battery is properly connected. If connected properly, go to step 3. If not connected properly, re-connect it.



- b. Check that electrical plug is pushed into distributor.

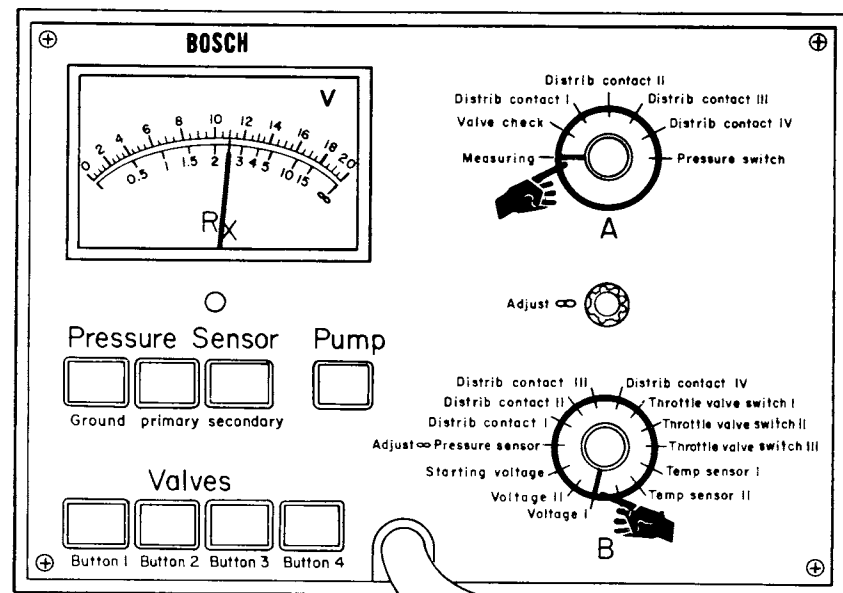


- 3.a. Go to pressure sensor. (See locator diagram.)
- b. Remove electrical connector from sensor.
- c. Be sure contacts on plug are clean. If dirty, clean them. Reconnect plug.
- d. Attempt to start engine. If engine starts, job complete. If engine doesn't run, go to step 4.



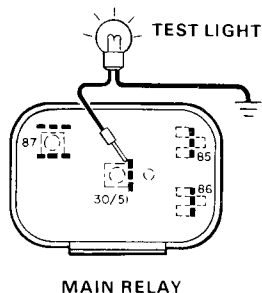
- 4.a. Locate coolant temperature sensor. See locator diagram. If body of sensor is black, replace it with a new sensor (brown body).
- b. Attempt engine start. If engine starts, job complete. If engine doesn't start, go to step 5.

- 5.a. Connect Bosch Injection System Tester to control unit as directed in Part I of this section.
- b. Turn switch A to MEASURING.
- c. Turn switch B to Voltage I.
- d. Turn on ignition.
- e. Pointer should indicate between **10.5 to 12.5** volts.
- f. If meter indicates OK, go to step 7. If less than **10.5** volts, charge battery. If **0** volts, go to step 6.

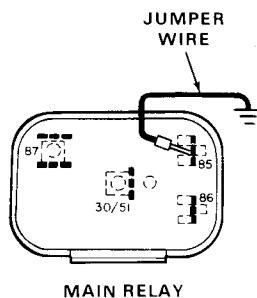


- 6.a. Get 12-volt test light.
- b. Be sure ignition is on.
- c. Go to main relay (see locator diagram).

- d. Connect test light between red wire (relay terminal 30/51) and ground. If light does not light, repair or replace red wire to battery. If light comes on, go to e.

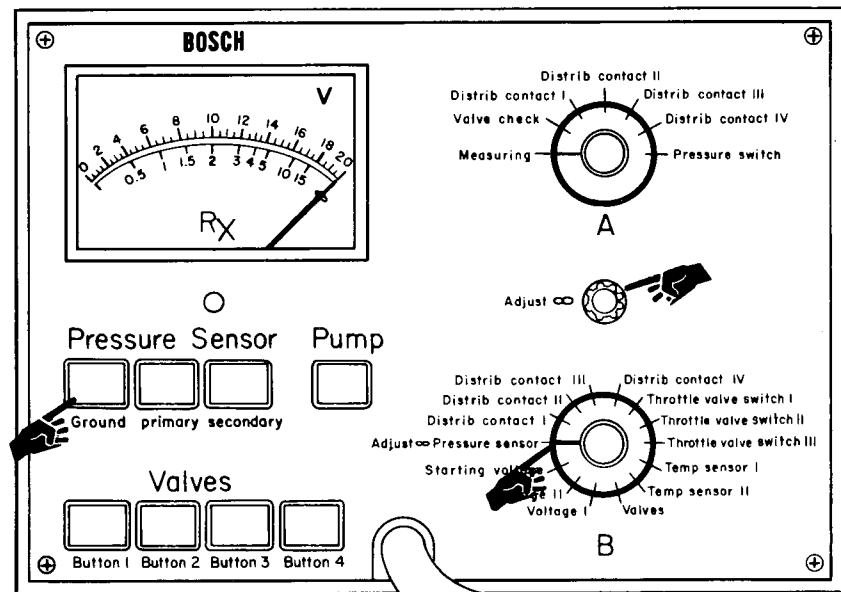


- e. Ground terminal 85 with a jumper wire. If relay operates (clicks), repair or replace black ground wire from relay.

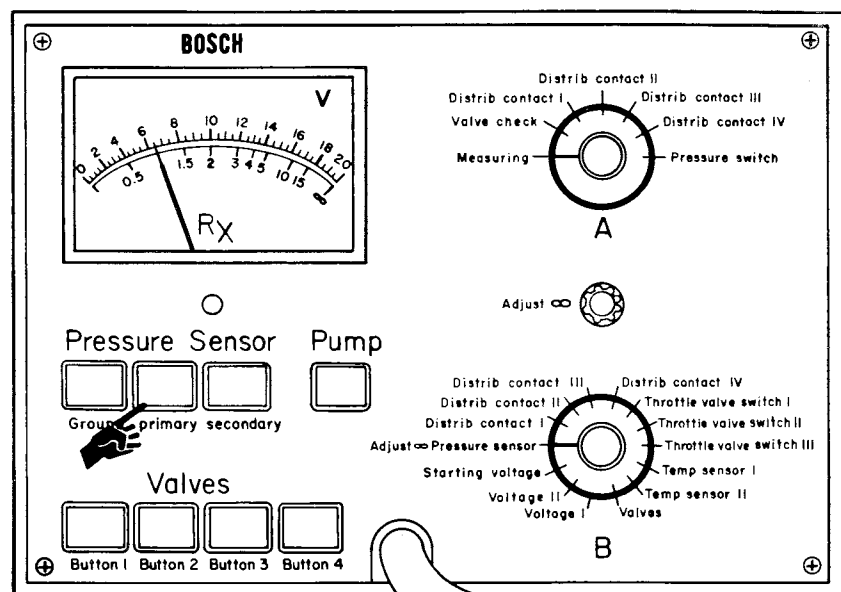


- f. Get a known good relay. Temporarily shift relay wires. Attempt to start engine. If engine starts and runs, replace main relay. If car doesn't run, go to step f.

- 7.a. Turn switch B to ADJUST ∞ , PRESSURE SENSOR.
- b. Turn ADJUST ∞ until pointer is at ∞ (right side of scale).
- c. Push and wiggle GROUND button. If pointer does not move, go to step d. If pointer moves, pull plug from pressure sensor. Press GROUND button. If pointer does not move, replace sensor.

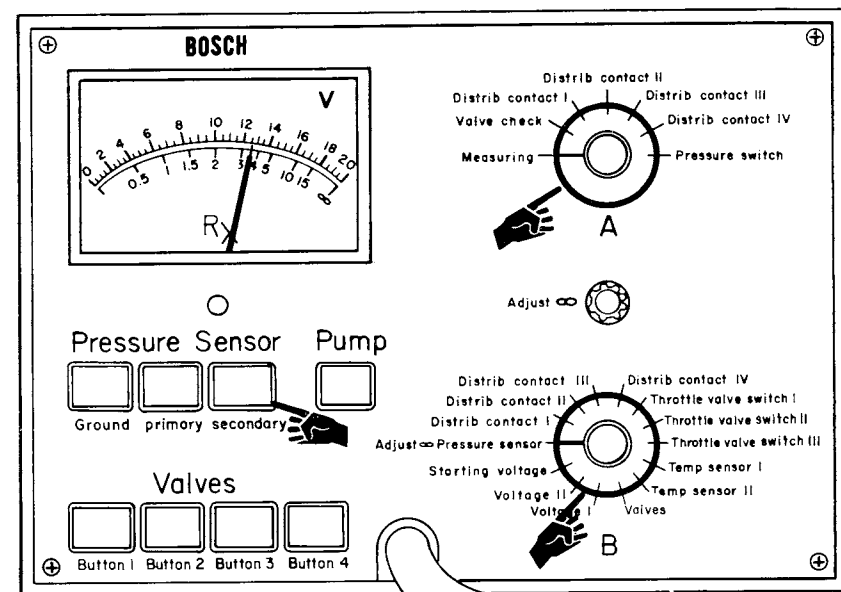
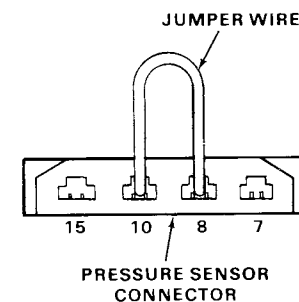


- d. Push PRIMARY button. If pointer indicates between **0.8** and **1.2** on bottom scale, go to step e. If meter indicates less than **0.8**, pull plug from pressure sensor. Again press primary button. If meter indicates **∞**, replace pressure sensor. If meter indicates less than **∞**, wiring to sensor is shorted. Repair or replace wiring.



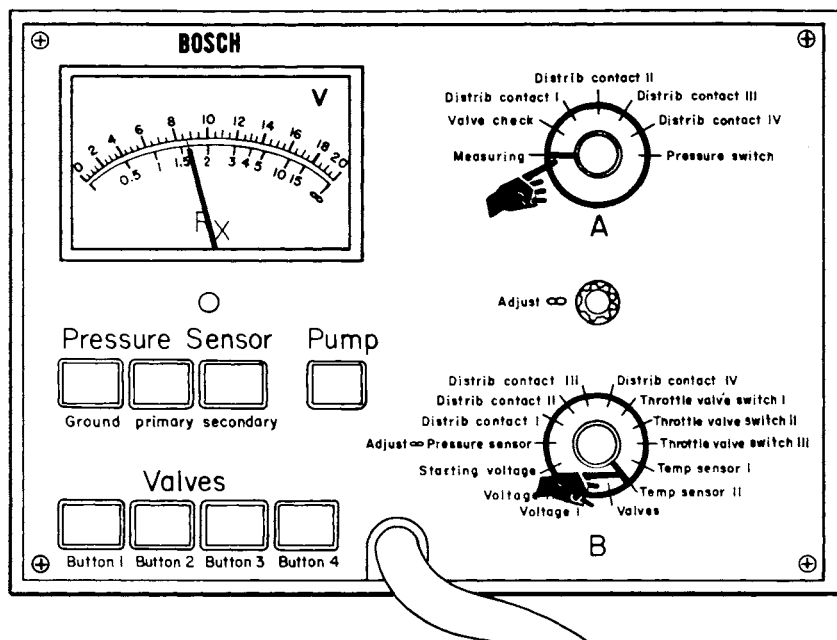
V15

- e. Push SECONDARY button. If pointer indicates between **3** and **4** on the lower scale, go to step 8. If pointer indicates less than **3**, replace pressure sensor. If pointer indicates **∞** (right side of scale), jump plug contacts 10 and 8 as shown. Push SECONDARY button. If pointer indicates **0**, replace sensor. If pointer indicates **∞**, check for broken wiring to pressure sensor.



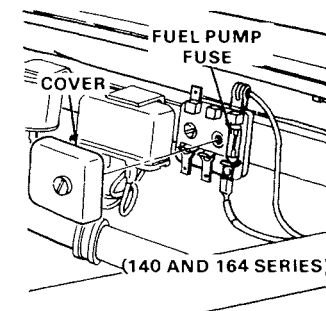
V16

- 8.a. Turn switch B to TEMPERATURE SENSOR 11.
- b. Meter indication should be between **0.5** and **3.5**. If not between **0.5** and **3.5**, **replace** coolant sensor. If meter reading OK, go to 11.



V24

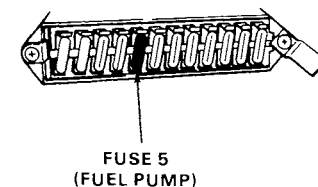
- 9.a. On 140 series and 164 models, open hood. Locate fuse panel on fender near battery. Remove screw and cover. On 1800 models, go to fuse panel on dashboard. Remove covers.



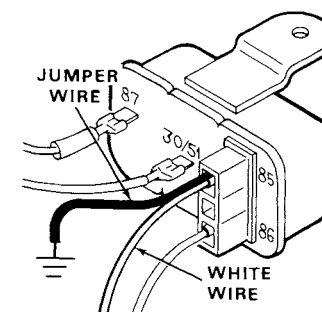
(140 AND 164 SERIES)

- b. Check fuel pump fuse. If OK, go to step 10. If blown, replace it with an 8-amp fuse.
- c. Attempt to start engine. If second fuse blows, check wiring to pump. If wiring OK, replace pump. (See wiring diagram.) If engine starts and continues to run, replace fuse panel covers, job complete.

(1800 SERIES)

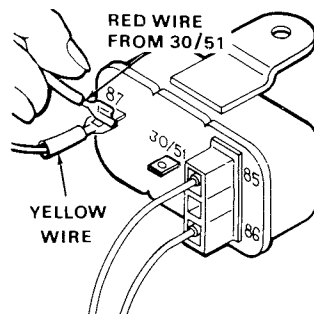


- 10.a. Go to fuel pump relay. (See locator diagram.)
- b. Connect insulated jumper wire between wire connected to terminal 85 and bare metal ground.



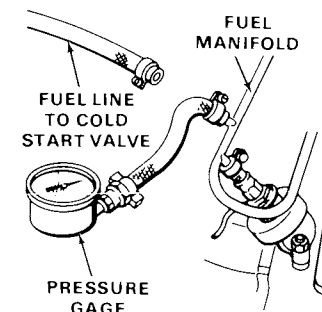
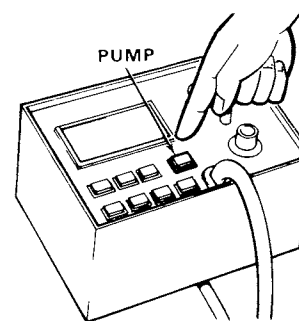
- c. If pump doesn't run, proceed to next step. If pump runs, check white wire to control unit. If wire OK, replace control unit.

- d. Disconnect red wire from terminal 30/51.
e. Touch red wire to wire on terminal 87. Listen for fuel pump running (hissing sound).

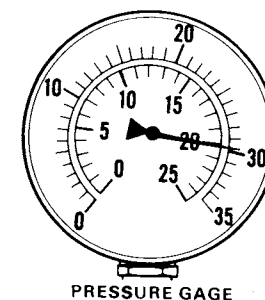


- f. If pump runs, replace relay. If pump doesn't run, check wire to main relay. If wire OK, check main relay as directed back in step 6. If main relay OK, go to step g.
g. Check pump ground wire. If OK, go to step h.
h. Get a known good fuel pump. Go to fuel pump (see locator diagram). Disconnect electrical plug from installed pump and connect it to spare pump. If spare pump runs, replace installed pump with spare pump.

- 11.a. Get fuel pressure gage.
b. Connect gage to pressure regulator as shown.
c. Turn on ignition. Hold pump button on meter down.

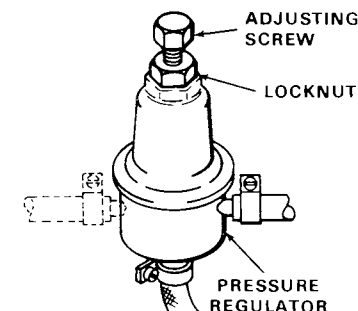


- d. Check fuel pressure on gage. Pressure should be **29.8 pds/sq. in. (2.1 Kp/Cm²)** on 140 models or **31.3 pds/sq. in. (2.2 Kp/Cm²)** on 160 models. If pressure is OK, go to step f. If low, go to step e.

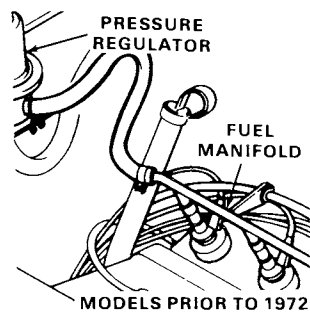
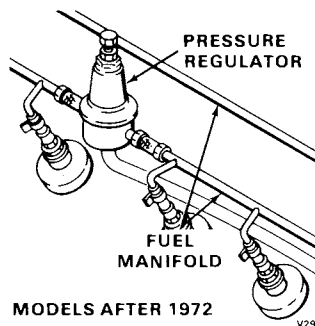


V48

- e. Loosen locknut on pressure regulator. Turn adjusting screw until pressure is **29.8 pds/sq. in. (2.1 Kp/Cm²)** on 140 models or **31.3 pds/sq. in. (2.2 Kp/Cm²)** on 160 models. Tighten locknut. If unable to adjust pressure, replace regulator.

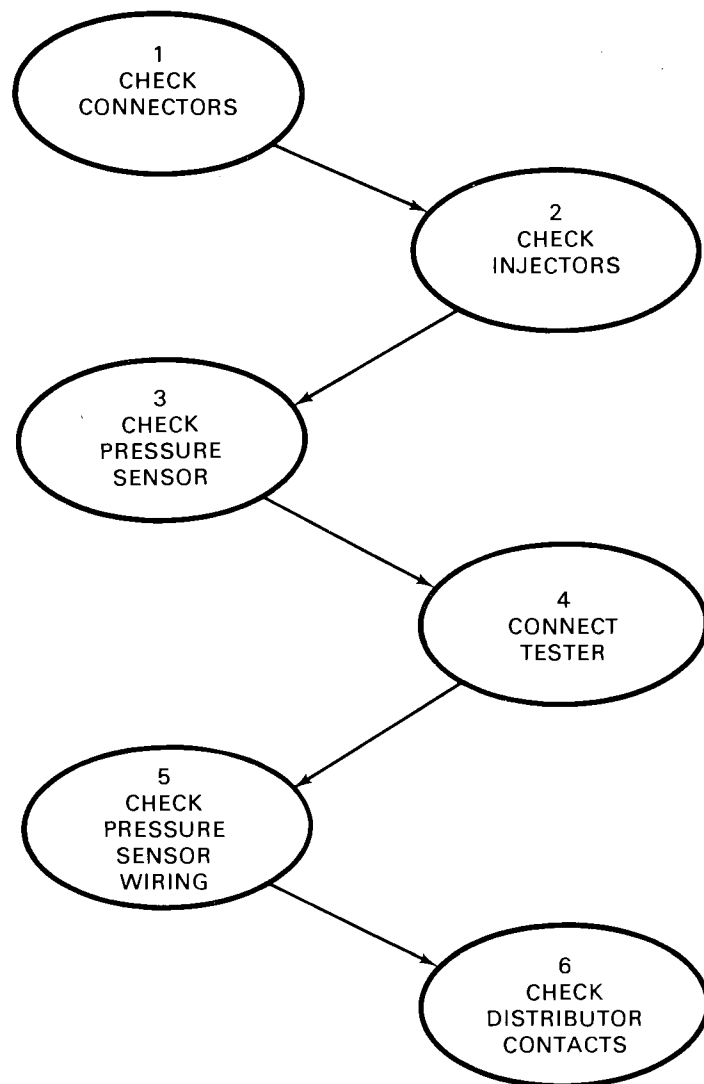


- f. Check for pinched fuel tubes from regulator. Replace any defective tubes. If tubes OK, replace control unit.



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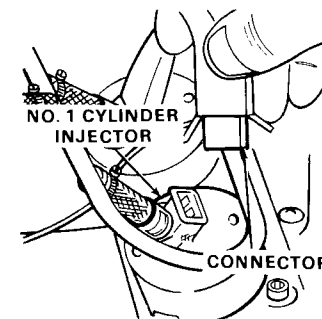
ENGINE RUNS ROUGH



ENGINE RUNS ROUGH

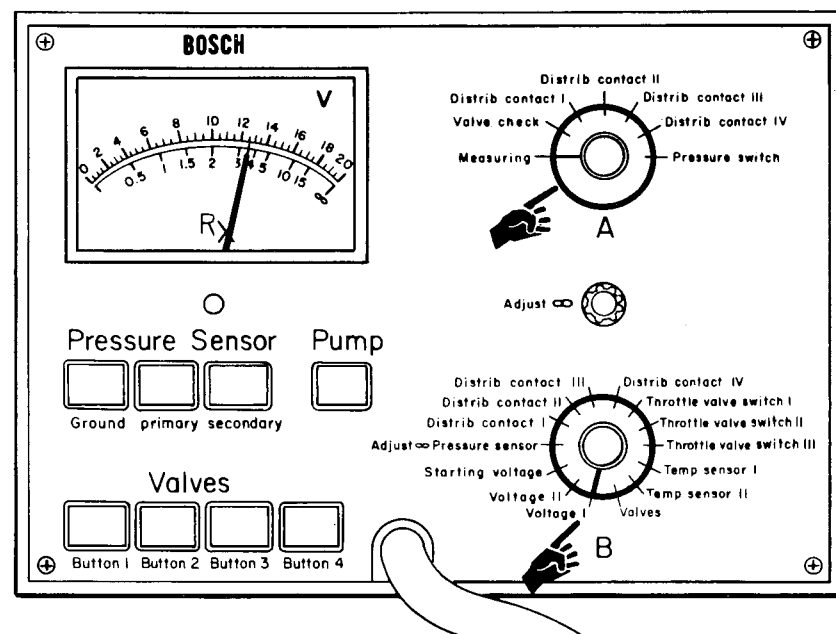
- 1.a. Open hood.
- b. See locator diagram. With engine running, push in the connectors on each injector, pressure sensor, throttle valve switch, temperature sensor I (inlet air), temperature sensor II (cooling liquid), distributor contacts, and the start valve. If the roughness stops, with the connector pressed in, replace the connector or repair wiring. If roughness does not stop, go to step 2.

- 2.a. With the engine running, remove the connector from the injector of each cylinder; starting at No. 1 cylinder. If the roughness increases as the connector is removed from the injector, replace the connector and repeat the test on the next cylinder. If the roughness does not increase with the connector removed from an injector, this is a bad cylinder, go to step b.



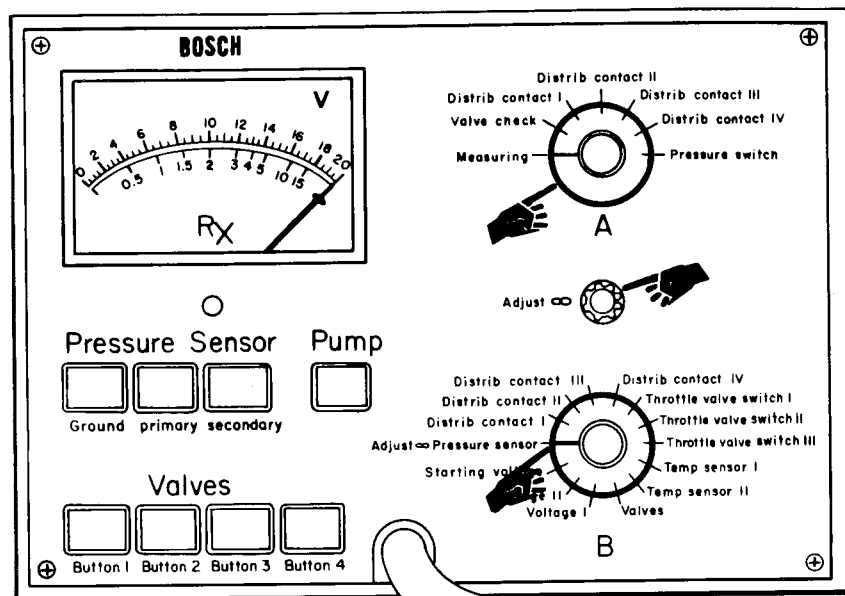
- b. If the connector is removed from an odd numbered cylinder, remove the connector from another odd numbered cylinder. If the connector is removed from an even numbered cylinder, remove the connector from another even numbered cylinder. Go to step c.
 - c. Insert the first connector that was removed in the second injector. If the engine smooths out as the connector is inserted, indicates the wiring to this connector is OK, replace the injector in the bad cylinder. If the engine does not smooth out as the connector is inserted, indicates the wiring to this connector is bad. Repair or replace the wiring. If wiring OK, replace control unit.
 - d. If the preceding tests do not reveal the cause of the roughness, go to step 3.
- 3.a. Get a known good pressure sensor.
 - b. Go to pressure sensor installed in car. Remove electrical connector and pressure hose from sensor.
 - c. Temporarily connect electrical connector and pressure hose to new pressure sensor. Run engine. If engine OK, install new pressure sensor. If engine still rough, go to step 4.

4. Connect Bosch Injection System Tester to computer as directed in Part I of this section. When tester is connected, go to step 5.
- 5.a. Turn switch A to MEASURING. Turn switch B to VOLTAGE I. Turn on ignition.



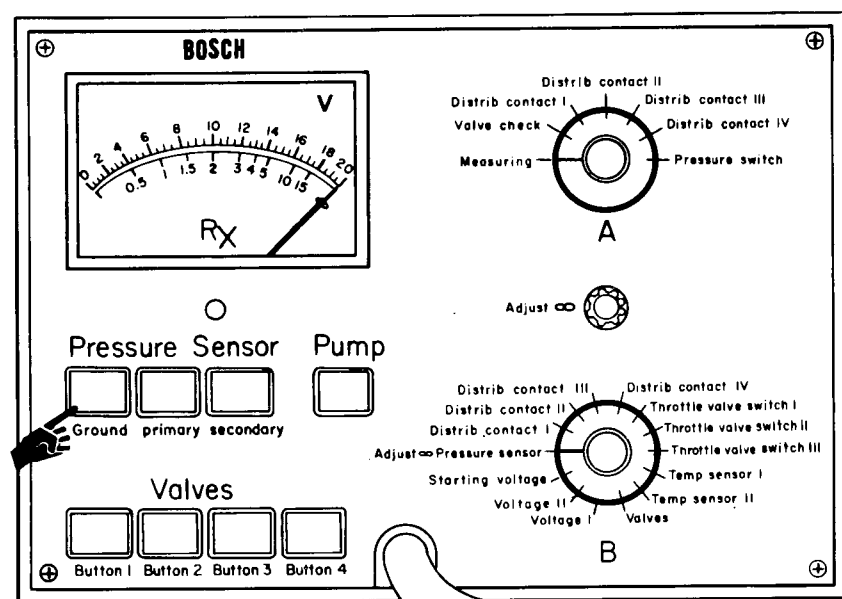
- b. Check that pointer on meter is more than **11 volts**. If less than **11 volts**, recharge battery or check electrical system.

- c. Turn switch B to adjust ∞ PRESSURE SENSOR. Turn ADJUST ∞ KNOB until pointer is even with ∞ end of scale.



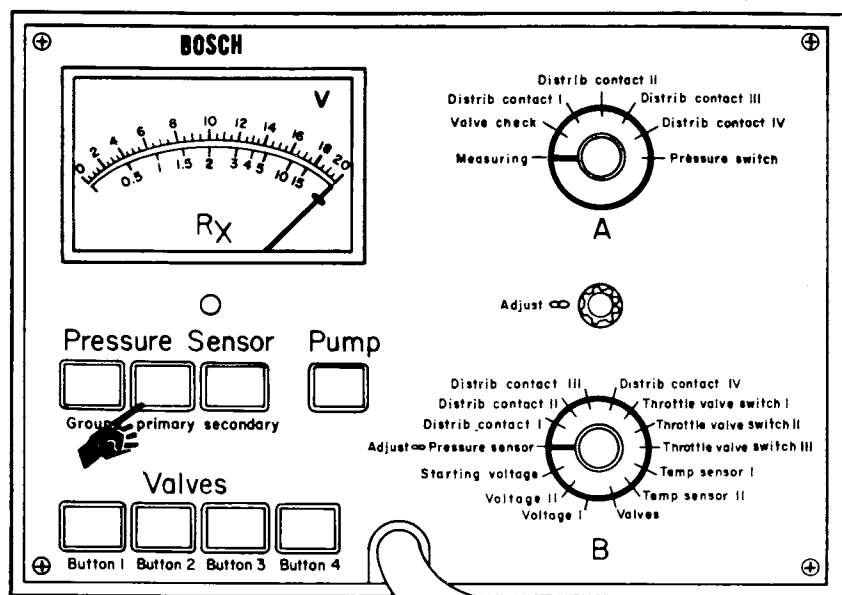
V32

- d. Pull connector from pressure sensor. Push and wiggle GROUND button. Pointer should not move. If pointer moves, repair or replace wiring to pressure sensor.

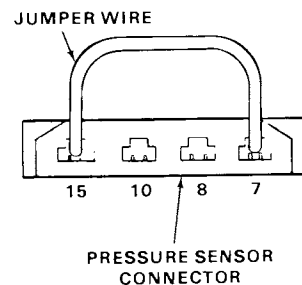


V33

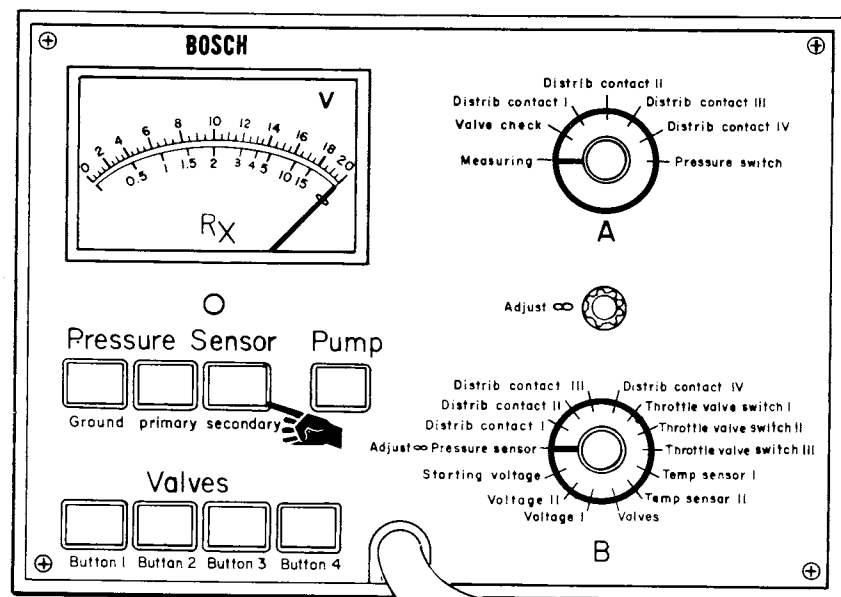
- e. Push **PRIMARY** button. If pointer does not move, go to step f. If pointer moves, repair or replace shorted primary wiring to pressure sensor.



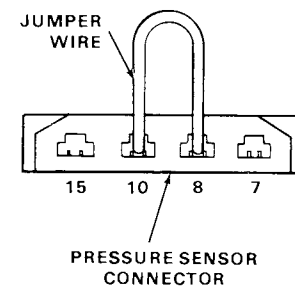
- f. Short pressure sensor connector as shown. Press **PRIMARY** button. If pointer indicates **0**, go to g. If pointer indicates ∞ , repair open wiring to sensor.



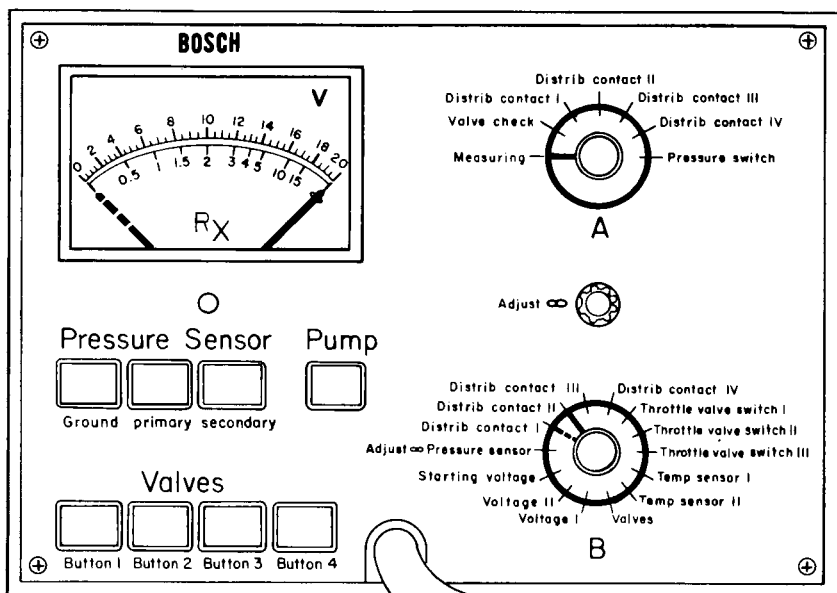
- g. Push secondary button. If pointer does not move, go to step h. If pointer moves, repair or replace shorted secondary wiring to pressure sensor.



- h. Short pressure sensor connector as shown. Push **SECONDARY** button. If pointer indicates **0**, go to step 6.a. If pointer indicates ∞ , repair open wires to sensor.

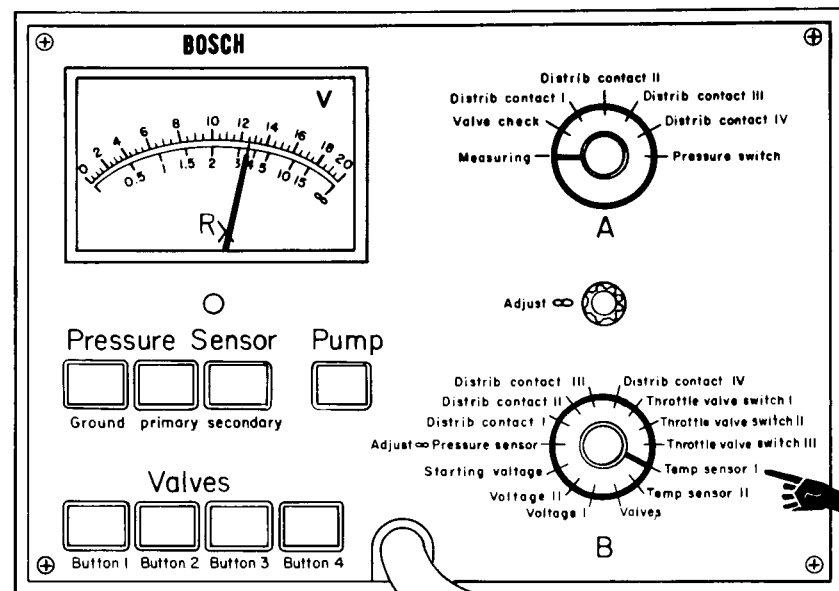
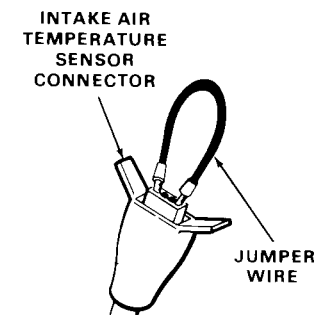


- 6.a. Turn switch B to DISTRIB CONTACT 1. Note pointer position. Turn switch B to DISTRIB CONTACT 11. Pointer should swing to opposite end of meter. For example, if pointer was at 0 with switch B at DISTRIB CONTACT 1; it should be at ∞ with switch B or DISTRIB CONTACT 11. If pointer was at ∞ with switch at DISTRIB CONTACT 1, it should be at 0 with switch at DISTRIB CONTACT 11. Turn switch B to DISTRIB CONTACT 1. Note pointer position. Jog starter until pointer is at opposite end of meter. Turn switch B to DISTRIB CONTACT 11.

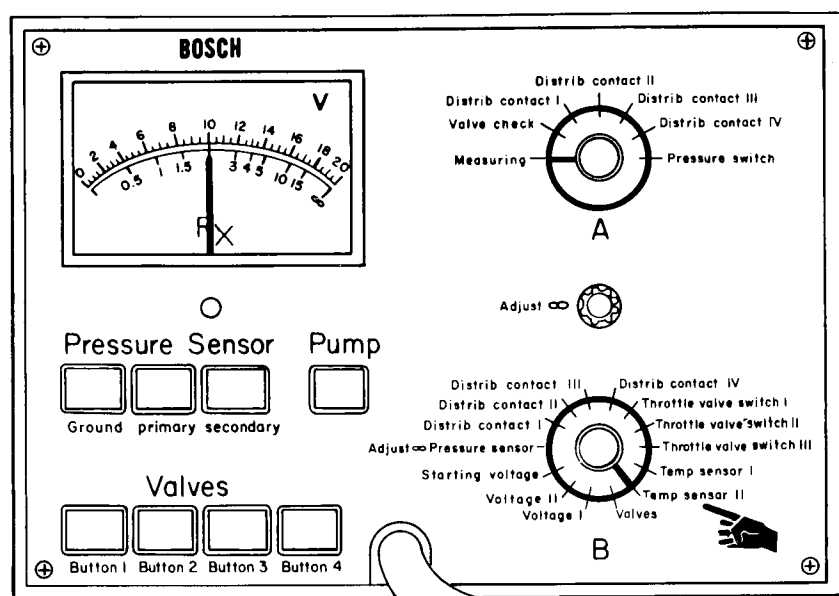
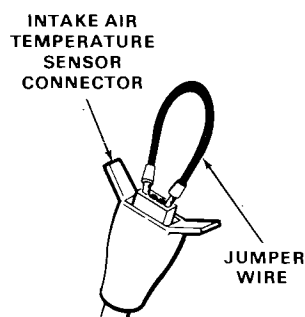


Meter should swing to opposite end of scale. If distributor contacts are defective, replace them. If not defective, proceed to step b.

- b. Turn switch B to TEMPERATURE SENSOR 1. If pointer is between 2 and 5, go to step c. If less than 2, pull plug from intake air sensor. If pointer swings to ∞ , replace sensor. If pointer is less than 2, repair or replace wiring to sensor. If more than 5, bridge connector with jumper wire as shown. If pointer drops to 0, replace sensor. If it remains above 5, repair or replace wiring to sensor.

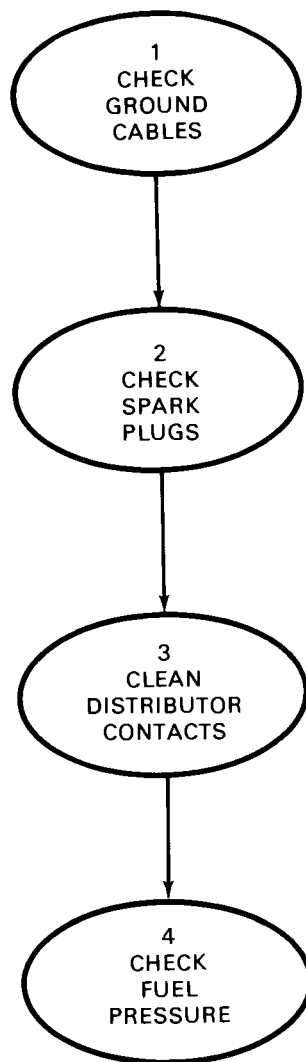


- c. Turn switch B to TEMPERATURE SENSOR 11. If meter indication is between **0.5** and **3.5**, go to step d. If ∞ , pull plug from liquid temperature sensor. Bridge connector with jumper wire. If pointer drops to **0**, replace sensor. If pointer remains above **5**, repair or replace wiring to sensor.
- d. Replace control unit



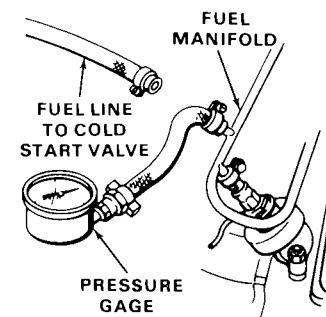
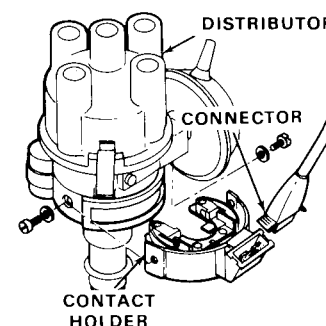
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ENGINE CUTS OUT (MISFIRES) WHEN DRIVING



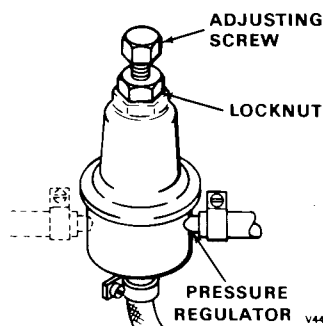
ENGINE CUTS OUT (MISFIRES) WHEN DRIVING

- 1.a. Check that all ground cables and straps are tight and not broken. (Go to locator diagram.) Be sure to check ground on exhaust manifold carefully. The bolt may loosen because of expansion rate difference between bolt and manifold.
2. Check that all spark plugs are tight.
- 3.a. Go to distributor.
 - b. Remove the electrical plug from the holder.
 - c. Remove the two screws attaching the holder to the distributor.
 - d. Remove holder.
 - e. If points are dirty, clean them with tv contact cleaner. Lightly lubricate rubbing blocks with Bosch grease. Do not attempt to adjust points.
 - f. Run engine. If OK, job complete. If still misfiring, go to step 4.
- 4.a. Get fuel pressure gage.
 - b. Connect gage to fuel manifold as shown.
 - c. Start engine.



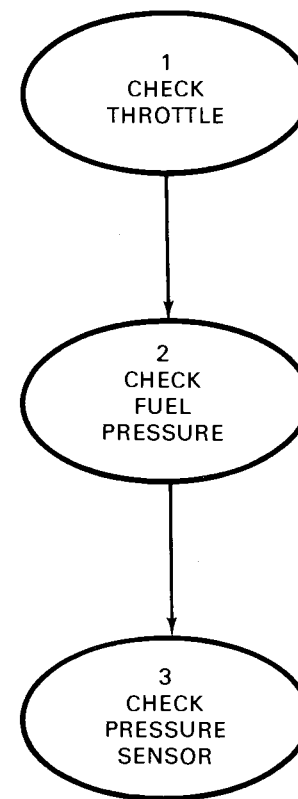
- d. Check fuel pressure on gauge. Pressure should be **29.8 pds/sq. in. (2.1 Kp/Cm²)** on 140 models or **31.3 pds/sq. in. (2.2Kp/Cm²)** on 160 models. If pressure OK, go to step f. If pressure low, go to step e.

- e. Loosen locknut on pressure regulator. Turn adjusting screw until pressure is as specified in step d. Tighten locknut. If unable to adjust pressure, replace regulator.



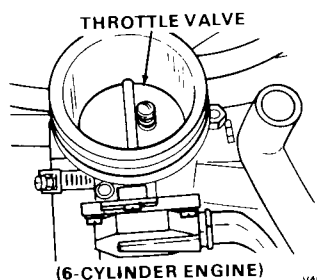
- f. Check for pinched fuel tubing from regulator to injectors. Replace any defective tubing.

ENGINE DOES NOT HAVE ENOUGH POWER



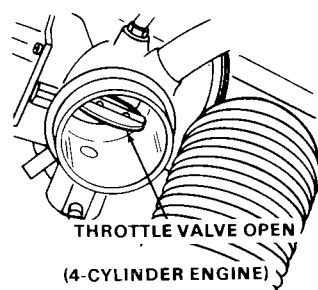
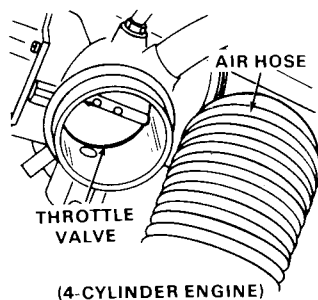
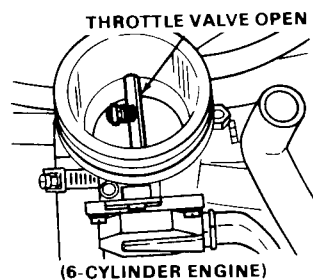
ENGINE DOES NOT HAVE ENOUGH POWER

- 1.a. Remove air hose from throttle, or remove air filter from throttle on 6 cylinder engines.

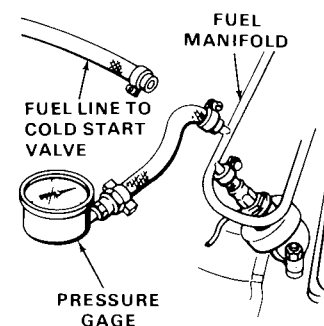


- b. Depress accelerator pedal.

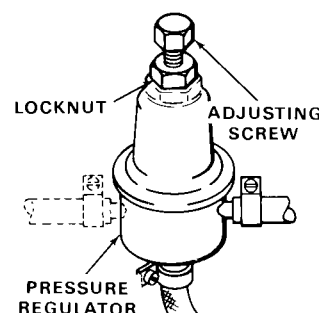
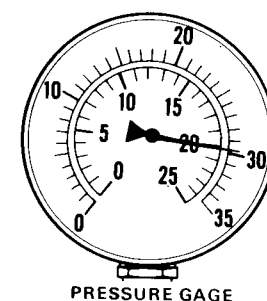
- c. Check that throttle valve opens fully. If throttle full open, go to step 2. If not full open, adjust throttle linkage.



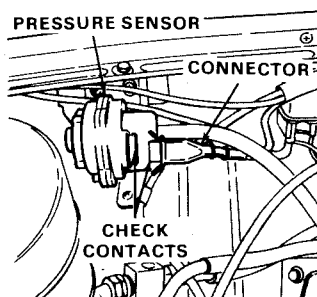
- 2.a. Get fuel pressure gage.
b. Connect gage to fuel manifold as shown.
c. Turn on ignition switch.



- d. Check fuel pressure. If fuel pressure **29.8 pds/sq. in. (2.1 Kp/Cm²)** on 140 models or **31.3 pds/sq. in. (2.2 Kp/Cm²)** on 160 models, go to step 3. If fuel pressure is low, loosen locknut on pressure regulator. Rotate adjusting screw until pressure is as specified. Tighten locknut. If unable to adjust pressure, replace pressure regulator.

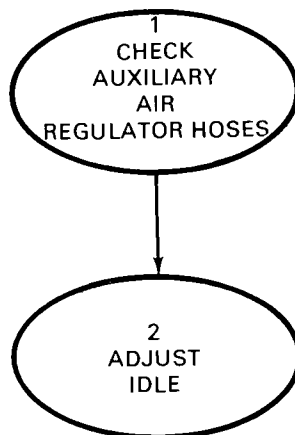


- 3.a. Go to pressure sensor.
- b. Disconnect electrical connector from sensor. Check that electrical contacts are clean. If dirty, clean them.
- c. Check engine. If OK, job complete. If still not enough power, go to step d.
- d. Get known good pressure sensor. Switch electrical connector and pressure hose to spare sensor. Check engine. If OK, replace sensor. If still misfiring, replace computer.



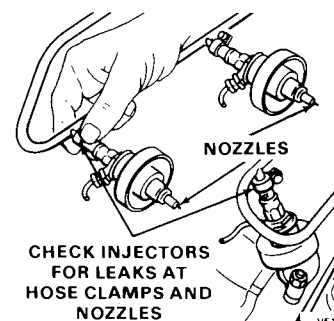
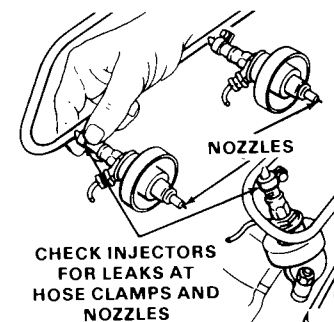
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FUEL CONSUMPTION TOO HIGH

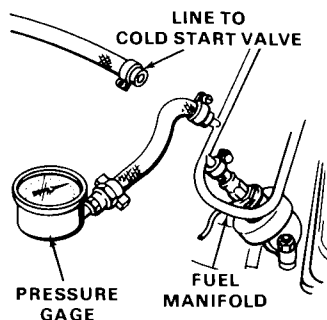


FUEL CONSUMPTION TOO HIGH

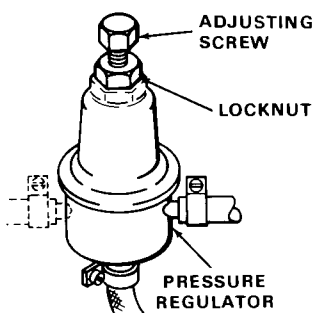
- 1.a. Start engine.
- b. Check injectors for external fuel leakage. If injectors are not leaking, go to step 2. If injectors are leaking, replace clamps on injector hoses.
2. Turn on ignition switch. Check all fuel lines to fuel pump for leaks. Repair any leaks. If fuel line not leaking, go to step 3.
- 3.a. Remove all injectors while still connected to fuel manifold.
- b. Turn on ignition.
- c. Check each fuel injector for fuel dripping or spraying from nozzle. Replace any defective injectors. If injectors OK, reinstall in cylinder. Go to step 4.



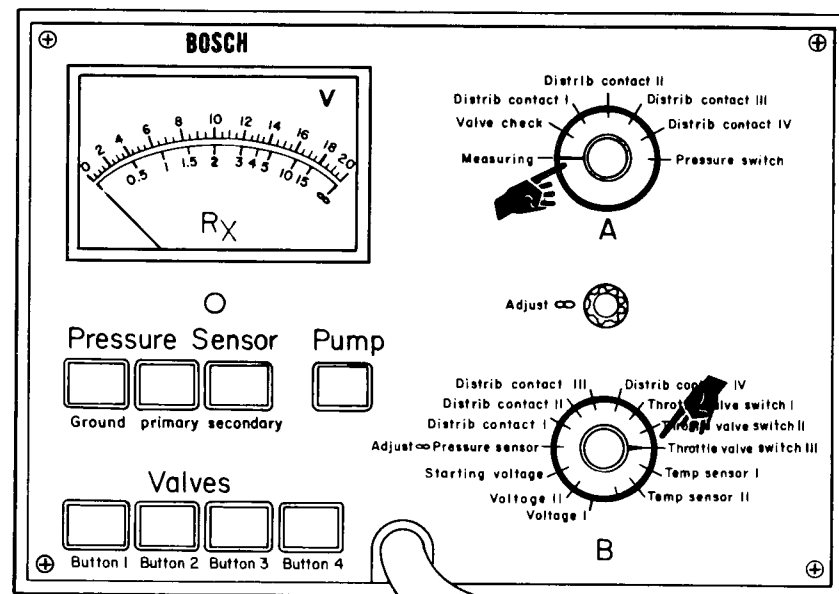
- 4.a. Get fuel pressure gage.
- b. Connect to fuel manifold as shown.
- c. Turn on ignition switch.



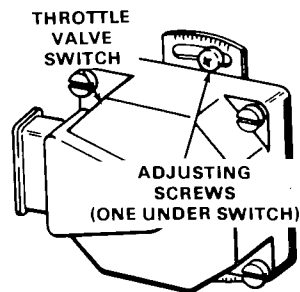
- d. Check fuel pressure. If pressure is **29.8 pds/sq. in. (2.1 Kp/Cm²)** on 140 models or **31.3 pds/sq. in. (2.2 Kp/Cm²)** on 160 models, go to step 2. If pressure is not as specified, loosen locknut on regulator. Turn adjusting screw until pressure is OK. Tighten locknut.



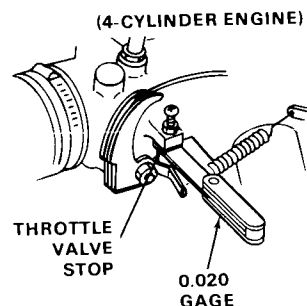
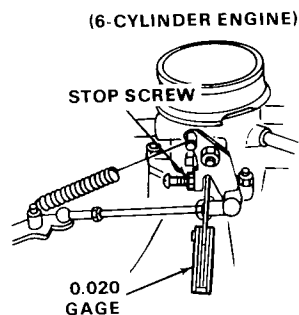
- 5.a. Get Bosch injection system tester. Connect tester to computer. Refer to Part 1 of this section.
- b. Turn switch A to MEASURING.
- c. Turn switch B to THROTTLE VALVE SWITCH III.



- d. Turn on ignition switch.
- e. With throttle closed (foot off accelerator pedal), meter should indicate 0Ω . If meter indicates 0Ω , go to step f. If meter does not indicate 0, loosen adjusting screws. Rotate throttle valve switch until meter just indicates 0. Tighten adjusting screws. Go to step f.



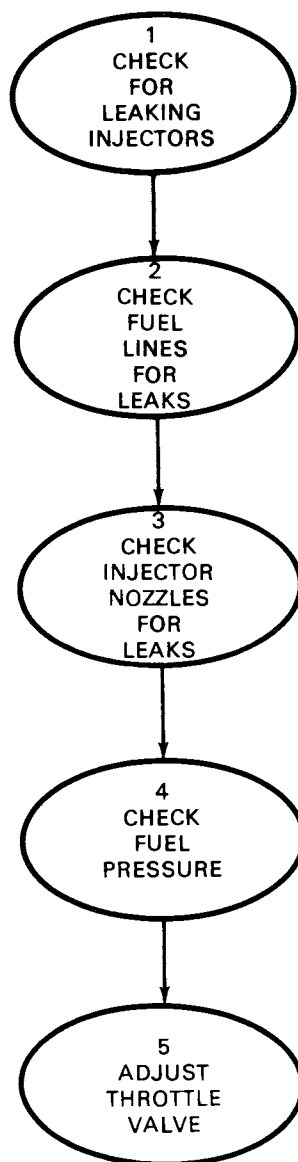
- f. Put **0.020**-inch feeler gage between stop screw and stop. Pointer should move to right side of meter (∞). If pointer doesn't indicate ∞ , adjust as directed in step e.



- g. If fuel consumption is still excessive, substitute another pressure sensor. If the replacement pressure sensor does not reduce fuel consumption, install the original pressure sensor, and replace the control unit.

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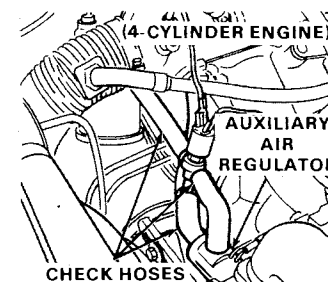
ENGINE HUNTS BETWEEN 1,000 AND 1,700 RPM
AT IDLE. (MODELS PRIOR TO 1972 ONLY)



ENGINE HUNTS BETWEEN 1,000 AND 1,700 RPM
AT IDLE. (MODELS PRIOR TO 1972 ONLY)

1.a. Go to auxiliary air regulator.
(See locator diagram.)

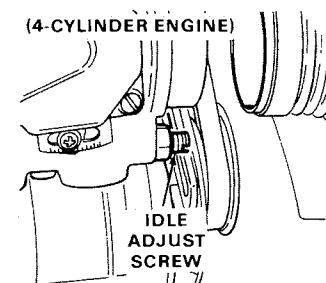
b. Check hoses between air regulator and induction (air) manifold. If hoses OK, go to step 2. If hoses are loose, porous, or broken, replace them.



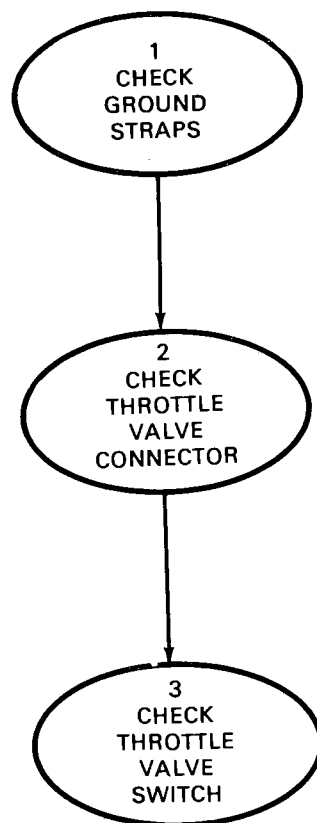
2.a. Remove air hose from front of manifold.

b. Start engine and warm up.

c. Adjust idle adjusting screw until tachometer indicates the idle RPM on the Vehicle Emission Control sticker on the firewall.

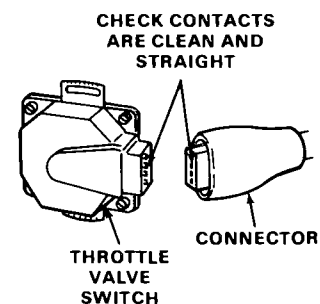


ENGINE MISFIRES WHEN ACCELERATING

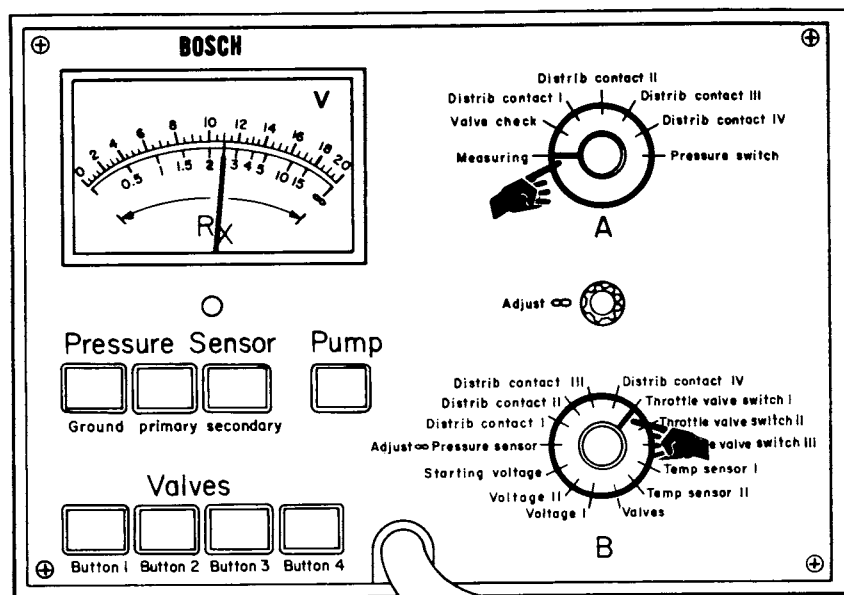


ENGINE MISFIRES WHEN ACCELERATING

- 1 Check ground strap(s). (See locator diagram.) If strap(s) are loose or broken, tighten or replace them. If straps OK, go to step 2.
- 2.a. Go to throttle valve switch.
 - b. Remove connector from switch.
 - c. Check that contacts on connector and switch are clean and straight. If dirty or bent, straighten or clean them. If contacts OK, go to step 3.

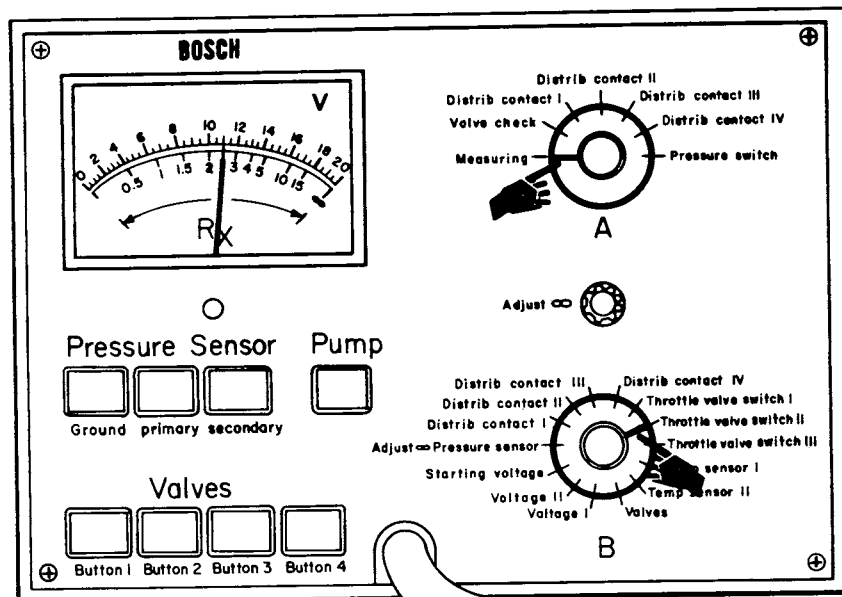


- 3.a. Get Bosch Injection System Tester.
- b. Connect to control unit as directed in Part 1 of this section.
- c. Turn switch A to measuring.
- d. Turn switch B to THROTTLE VALVE SWITCH I.



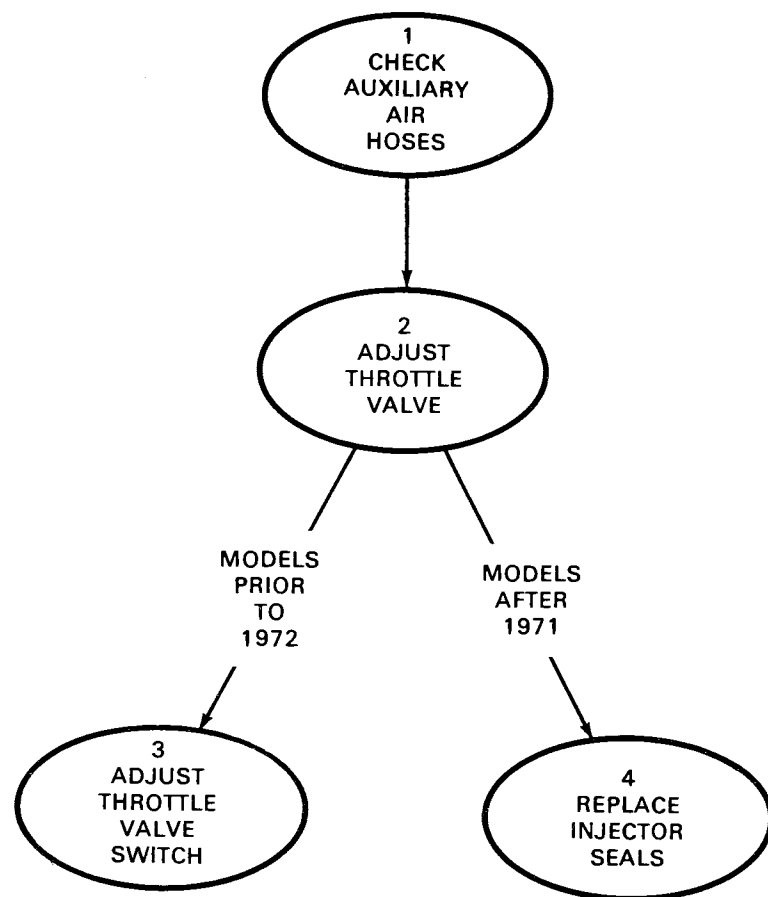
V64

- e. Depress accelerator pedal slowly, and check that meter needle swings between 0 and ∞ side of scale about 10 times. Check that needle remains at ∞ when depressed pedal is being released.
- f. Turn switch B to THROTTLE VALVE II. Repeat step e. If meter pointer does not move as specified in step e, replace throttle valve switch.



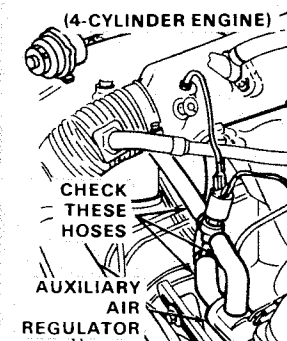
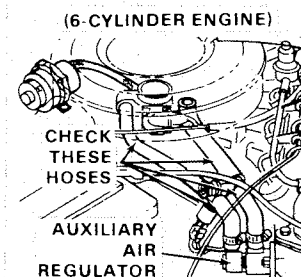
V65

ENGINE IDLES TOO FAST AND CANNOT BE ADJUSTED DOWN

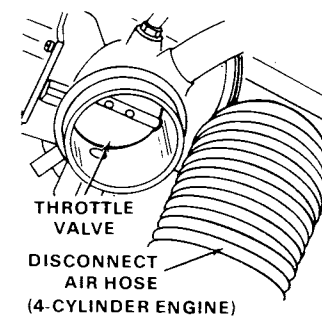
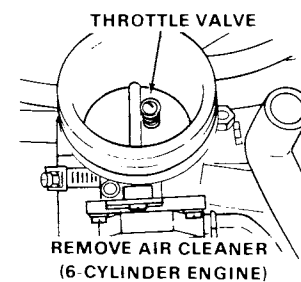


ENGINE IDLES TOO FAST AND CANNOT BE ADJUSTED DOWN

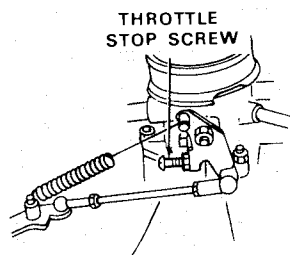
1. Check that hoses from auxiliary air regulator and pressure sensor to air manifold are tight and not broken. If loose or broken, tighten or replace them. If hoses OK, go to step 2.



- 2.a. On 4-cylinder engines, remove air hose from manifold. On 6-cylinder engines, remove air filter.

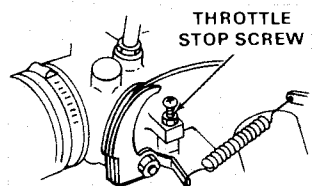


- b. Loosen locknut. Back-out throttle stop screw.
- c. Screw in stop screw until it just contacts the throttle valve lever. Then screw it in $\frac{1}{4}$ to $\frac{1}{2}$ turn. Tighten locknut.



(6-CYLINDER ENGINE)

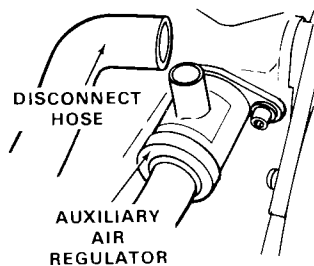
V68



(4-CYLINDER ENGINE)

- d. Check that throttle is not sticking closed.
- e. Check idle speed. If still too fast, go to step 3, on models prior to 1972. On models after 1971, go to step 4.

- 3.a. Disconnect top hose from auxiliary air regulator.



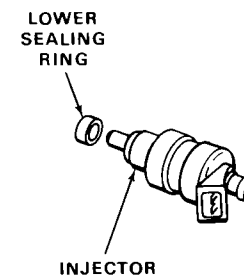
V70

- b. If engine rpm hunts between about **1,000** and **1,700**, throttle valve switch OK. Go to step 4. If engine rpm does not hunt with hose disconnected, adjust throttle valve switch.

4. Replace lower sealing rings on all injectors.

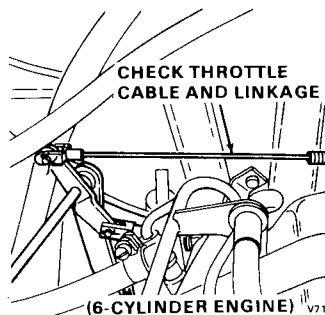
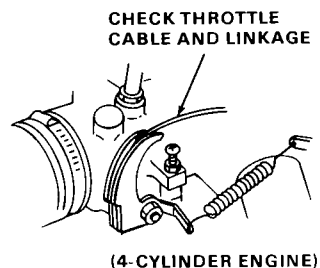
CAUTION

To prevent damage to the fuel manifold, lift fuel manifold with injectors attached from engine.

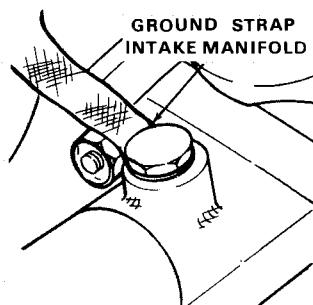


ENGINE WILL NOT ACCELERATE ABOVE IDLE (PEDAL FEELS LOOSE)

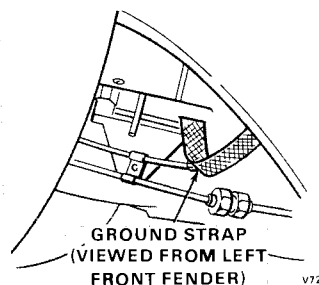
1.a. Go to throttle valve.



b. Check throttle cable. If cable broken, check that ground strap on intake manifold is tight and not broken. Check that ground strap between engine and chassis (under starter) is tight and not broken.



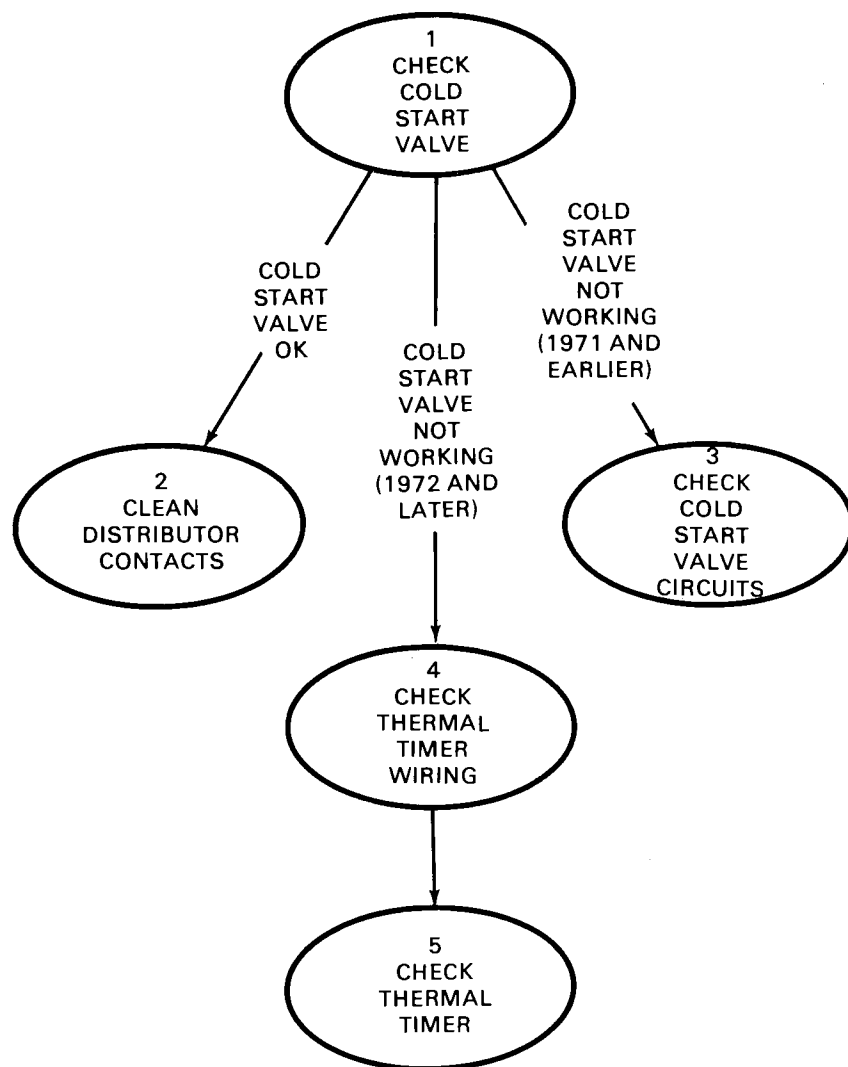
c. Tighten any loose connections or replace any broken ground straps.



d. Replace throttle cable.

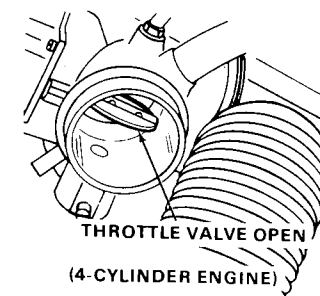
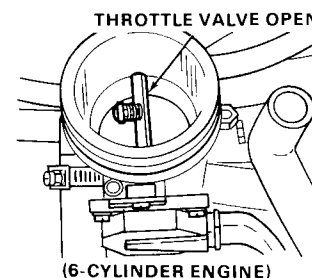
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ENGINE DIFFICULT TO START WHEN COLD (OK WHEN HOT)



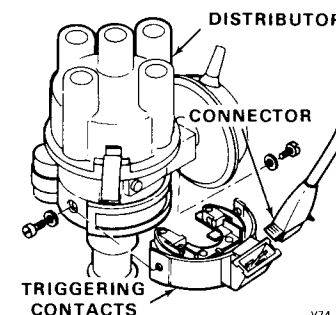
ENGINE DIFFICULT TO START WHEN COLD (OK WHEN HOT)

- 1.a. On 142E and 1800E, remove air hose from front of manifold. On 164E, remove air filter.
- b. Open throttle valve.
- c. Turn over engine with starter. Look into throttle throat. Check that cold start valve is injecting fuel into manifold.



- d. If fuel is injected into manifold, go to step 2. If fuel is not injected, go to step 3 for models prior to 1972. Go to step 4, for 1972 and later models.
- 2.a. Go to distributor. (See locator diagram.)

- b. Disconnect electrical plug on bottom of distributor.



- c. Remove two screws attaching triggering contacts to distributor. Remove triggering contacts.

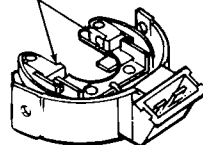
- d. Clean contacts of any grease or oil. Use television cleaner.

CAUTION

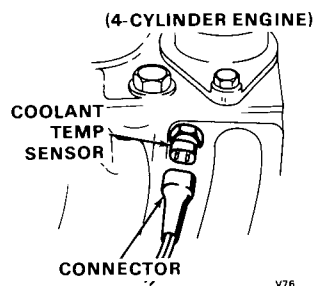
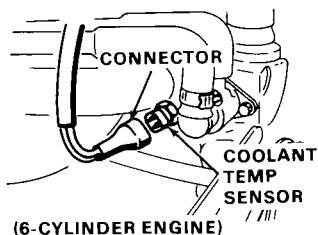
Do not try to adjust contacts.

- e. Lubricate rubbing blocks sparingly with Bosch grease.
- f. Reinstall contacts.

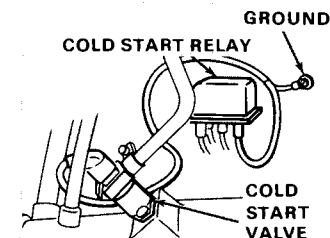
CLEAN AND
LUBRICATE
HERE



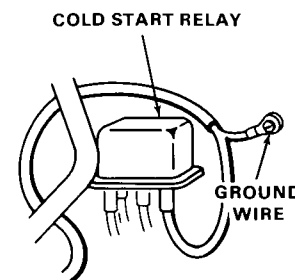
- 3.a. Remove connector plug from water temperature sensor. Crank engine. If fuel is sprayed into manifold, replace temperature sensor. If fuel is not sprayed, replace connector plug. Go to step b.



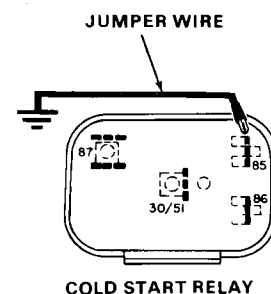
- b. Check that wire from start valve to the cold start relay is not broken or grounded. If wire OK, go to step c. If broken or grounded, repair or replace wire.



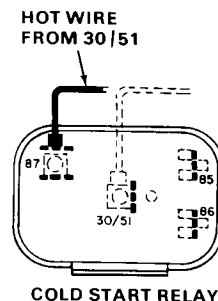
- c. Check ground wire from start valve. If OK, go to step d. If broken, repair or replace it.



- d. Remove wire from terminal 85 of cold start relay. Ground terminal 85. Crank engine with starter. If fuel is not sprayed into manifold, replace computer. If fuel is not sprayed into manifold, go to step e.



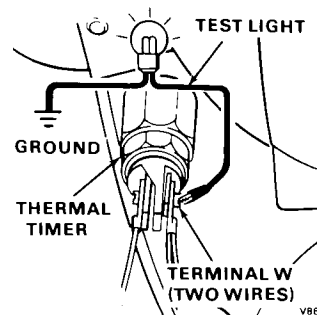
- e. Remove wire from terminal 30/51 of cold start relay. Connect to terminal 87. Crank engine with starter. If fuel is sprayed into manifold, replace relay. If fuel is not sprayed, replace cold start valve.



V90

- 4.a. Go to thermal timer. (See locator diagram.)

- b. Connect test light between contact w (two wire connection) on timer and ground.



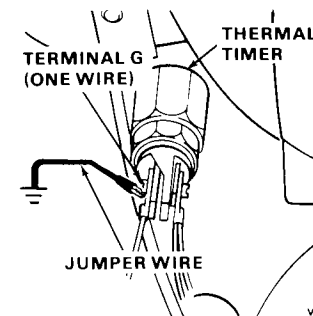
V86

- c. Crank starter. If light comes on, go to step 5. If light doesn't come on, repair or replace wire to starter terminal 50.

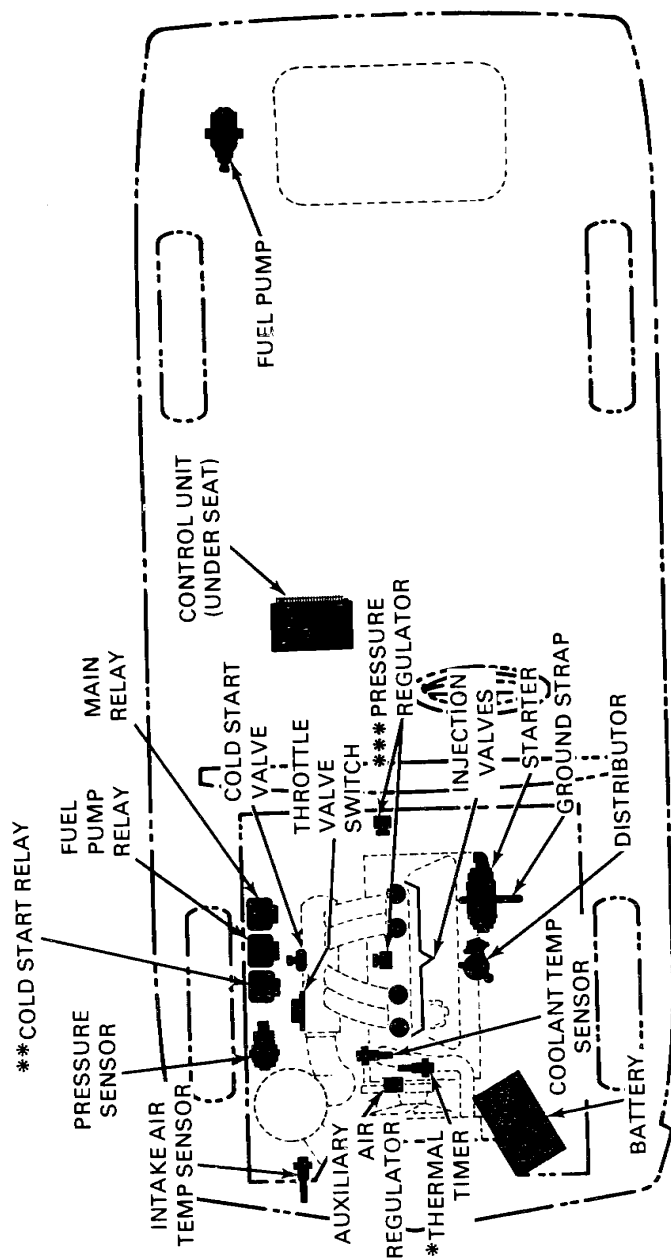
- 5.a. Connect jumper wire from thermal timer contact G (one wire connection) and ground.

- b. Crank starter. If fuel sprays from cold start valve or car starts, replace thermal timer. If fuel is not sprayed, go to step c.

- c. Check wiring from thermal timer to cold start valve. If wiring OK, replace cold start valve.



V87

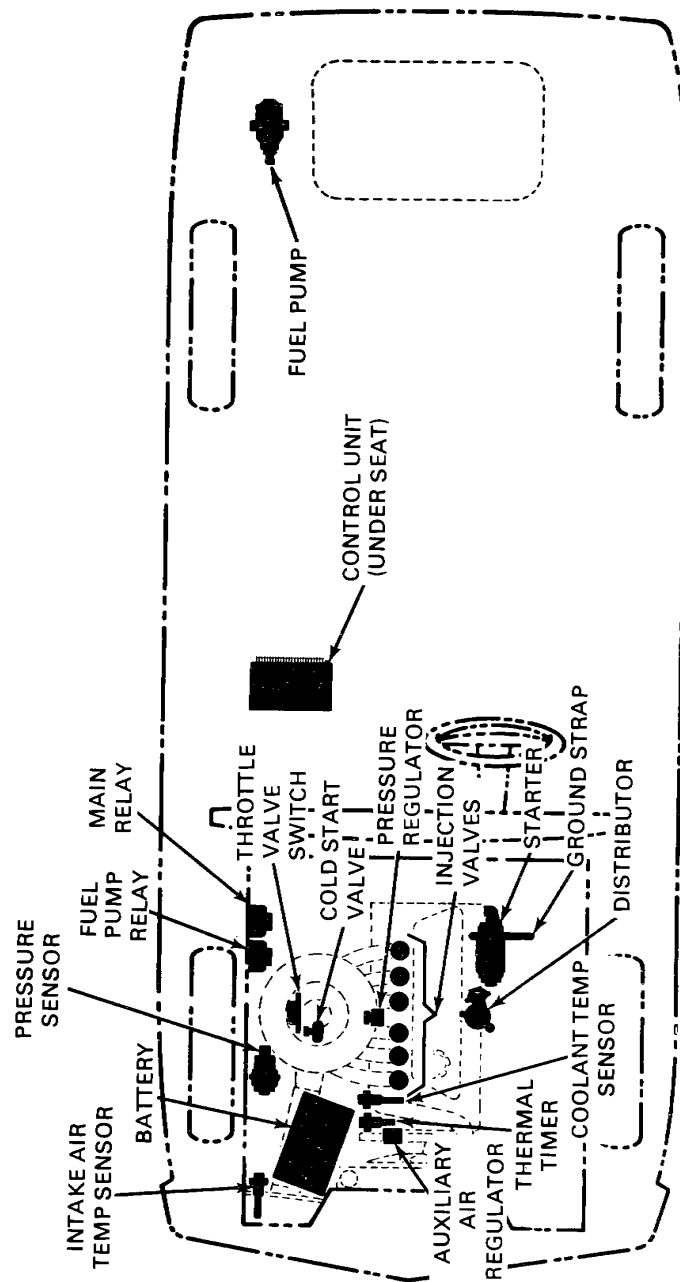


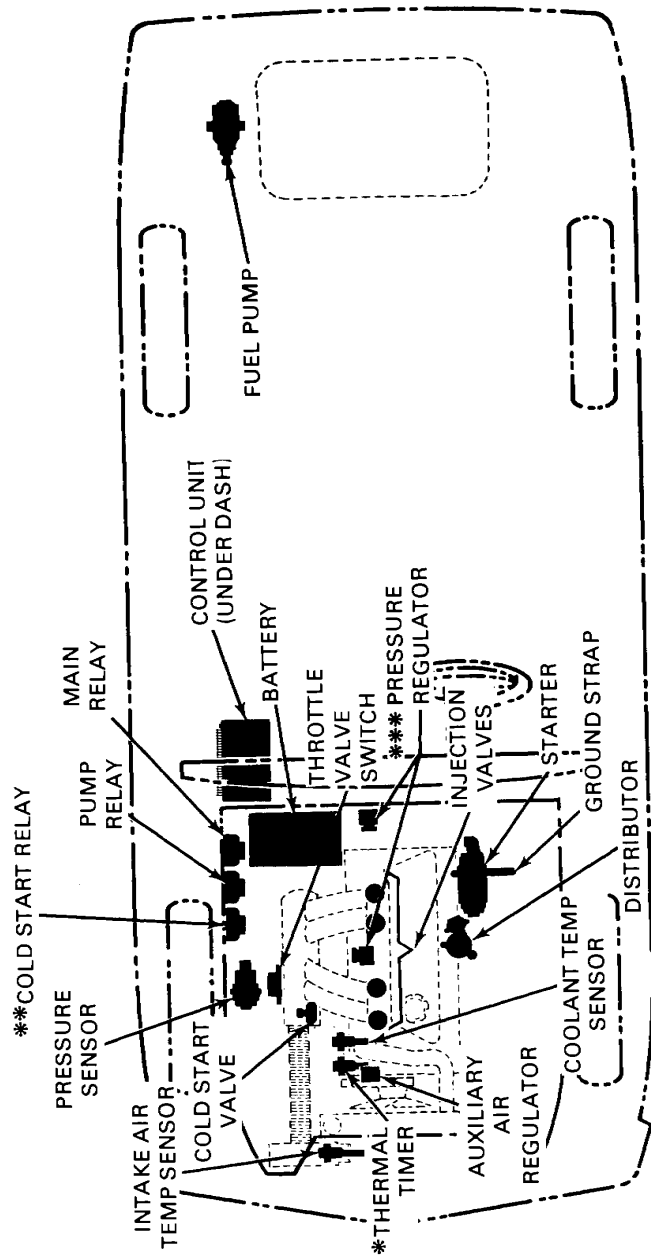
* ON 1972 MODELS AND SUBSEQUENT

** ON MODELS PRIOR TO 1972

*** PRESSURE REGULATOR MOUNTED ON FIREWALL ON MODELS PRIOR TO 1972

Locator Diagram For 142/144/145



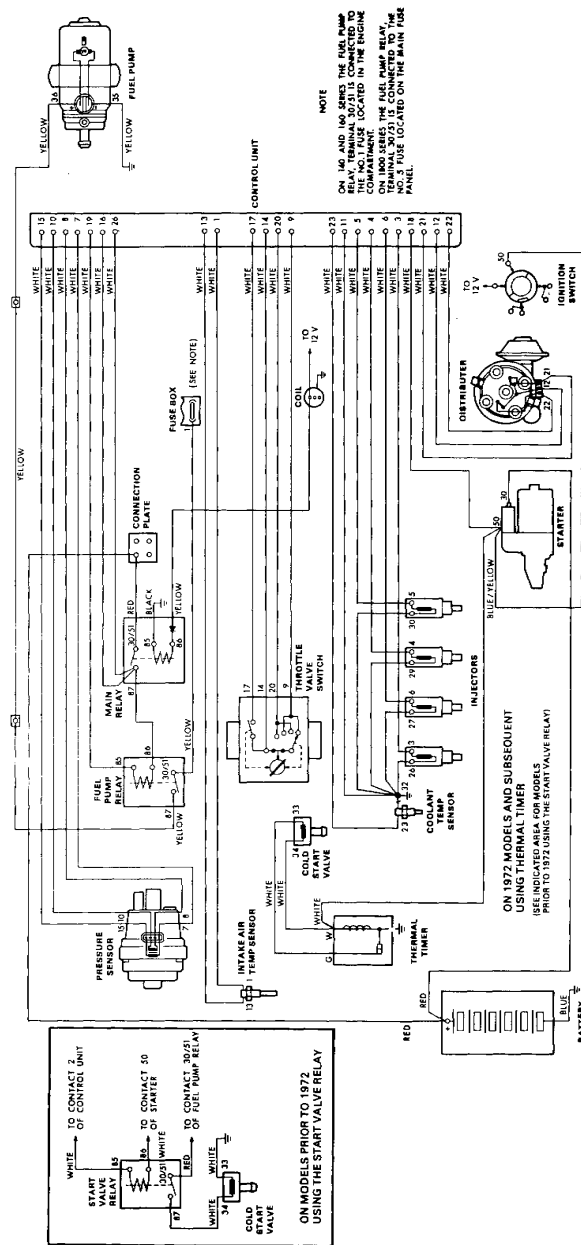


* ON 1972 MODELS AND SUBSEQUENT

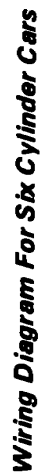
** ON MODELS PRIOR TO 1972

*** PRESSURE REGULATOR MOUNTED ON FIREWALL ON MODELS PRIOR TO 1972

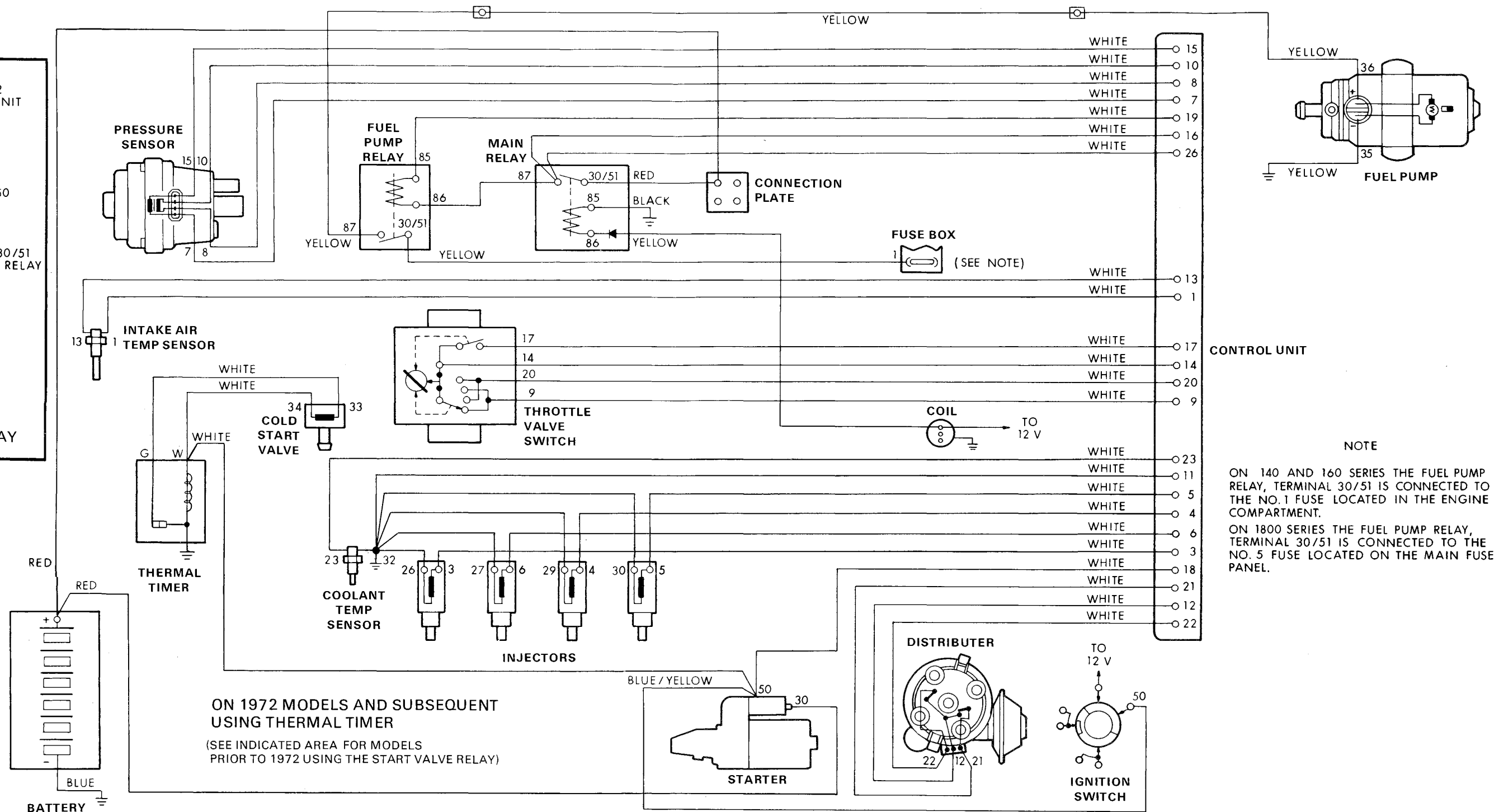
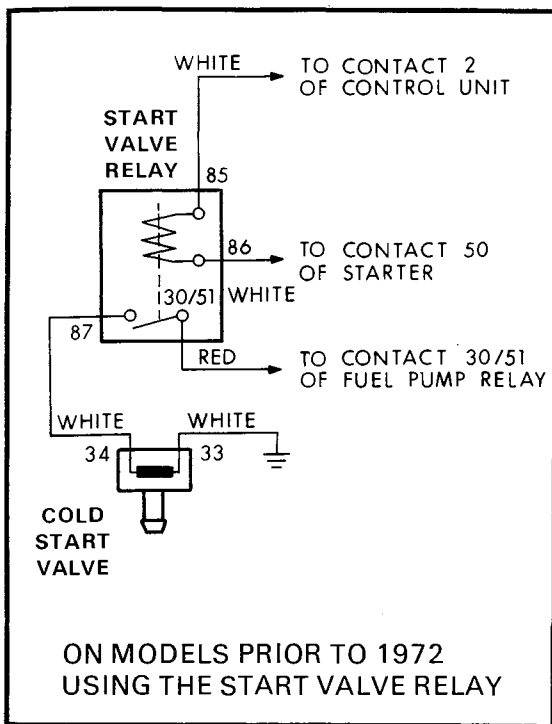
Locator Diagram For 1800E



Wiring Diagram for Four Cylinder Cars



Wiring Diagram For Six Cylinder Cars



Please send in this card when you complete a Fuel Injection Job.

Date done: _____

Check sections you used:

Section 2 ☐

Section 3 ☐

Circle any section above that gave you trouble or had errors.

May we contact you? ☐ Yes ☐ No

Please Print

Name

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State

Zip

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Number

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Do you want more books like this one?

Cost-\$1.00 each. *Check must come with order!*

Quantity

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_____ Overdrive rebuild

_____ Power steering rebuild

_____ Fuel Injection troubleshooting

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