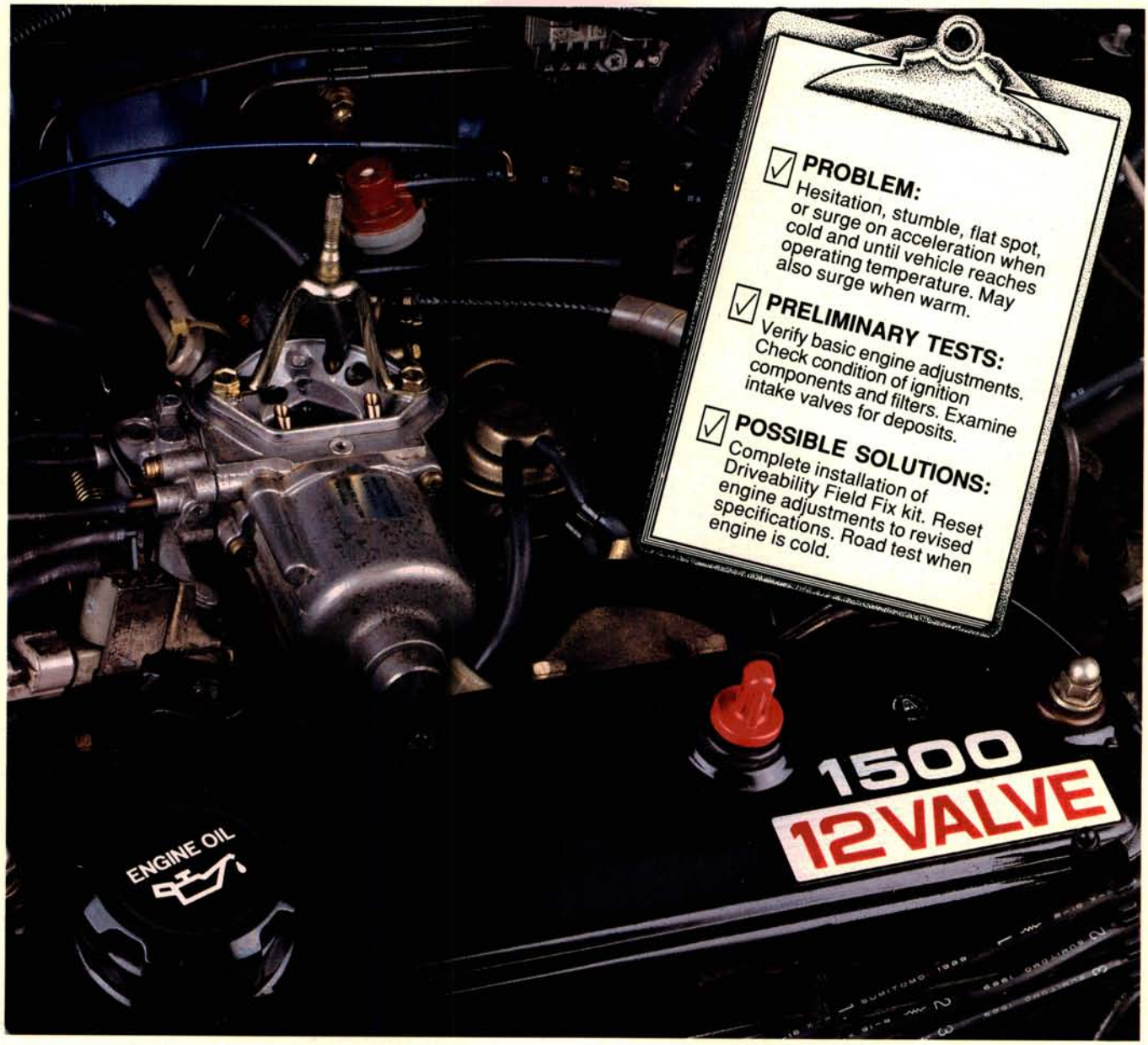


Toyota Variable Venturi

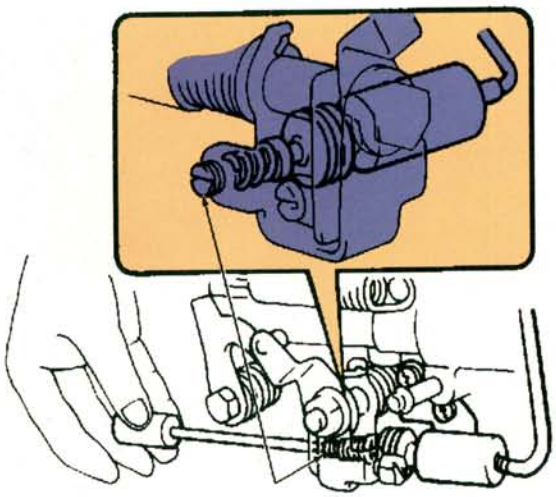
Part Two

If you made it through last month's vacuum hose jungle in the first installment of our Toyota Tercel variable venturi carburetor driveability modification, you have our congratulations. We can promise you that things will get much easier this time around. Installing the carburetor field fix kit may seem like a lot of work, but the results are certainly worthwhile. The kit made a noticeable improvement in the cold operation of our target Tercel, and we didn't think it was running that badly when we started.

Most of the kit components are already in place, so all that's left to do is make sure everything is hooked up and adjusted properly. Some of the kit components and carburetor parts are a little difficult to see when they're on the engine because they're buried under all those vacuum hoses. We'll take time before we get started to further explain the modifications and give you a better view of the components with illustrations.

Throttle Position Switch Operation

The field fix procedure includes changing the throttle position switch (TPS) adjustment. The TPS was originally adjusted so that it closed at 1400 RPM. After we adjust it, the TPS will close at 2000 RPM. Feedback fuel system operation begins when the TPS closes. Raising the TPS closing speed to 2000 RPM keeps the feedback system from activating at small throttle angles during light throttle application. This eliminates customer complaints of a jerking sensation when accelerating immediately after decelerating in the 35-40 MPH range.



Throttle Position Switch Adjusting Screw

The TPS is located at the bottom of the throttle linkage, on the right side of the carburetor. A very fine adjusting screw in the throttle linkage touches the tip of the TPS when the throttle is closed. This opens the TPS, causing the fuel system to operate in open loop.

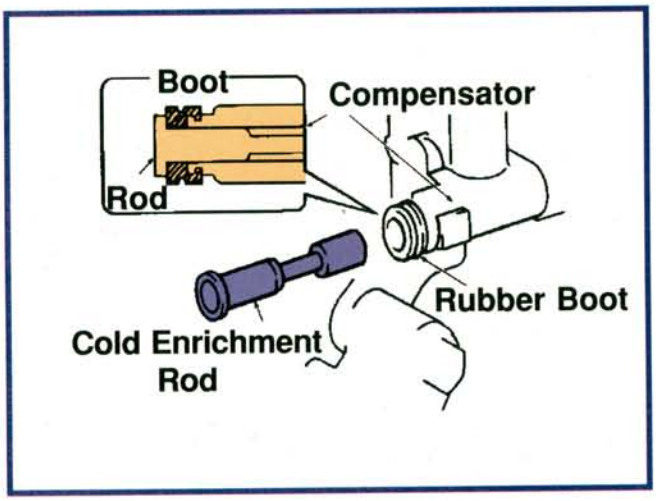
As the throttle opens, the adjusting screw loses contact with the TPS, and the TPS closes. The closed TPS grounds through the carburetor, signaling the ECU to shift into closed loop operation.

Describing how it works is easier than adjusting the TPS. A screwdriver of just the right size and length is needed to reach the tiny TPS adjusting screw. Spray the fine adjusting screw threads with penetrant and make sure your screwdriver fits the screw head tightly before you start. Turn the adjusting screw clockwise to increase the feedback RPM and counterclockwise to lower it. You're doing good if you can get the adjustment within 100 RPM of the 2000 RPM specification.

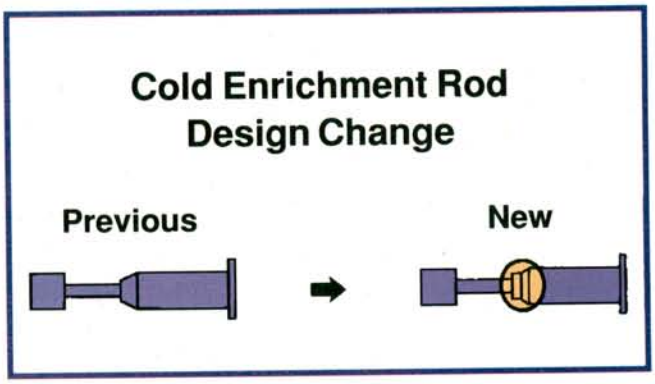
Cold Enrichment Rod Modification

Unlike a conventional carburetor, a variable venturi carburetor doesn't have a choke plate that it can close to richen the air fuel mixture during cold engine operation. Since the carburetor can't richen the mixture by limiting the flow of air, the only other option is to increase the flow of fuel.

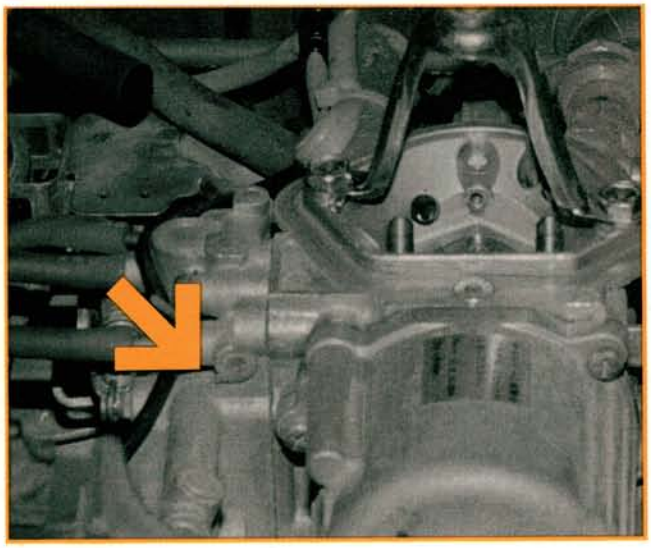
Fuel flow through the carburetor can be increased by blocking off carburetor air bleed ports, as we learned in the first part of our carburetor modification. The compensator on the side of the variable venturi carburetor also richens the mixture during cold operation to take the place of a conventional choke plate.



The design of the original cold enrichment rod caused the compensator system to shut off before the engine had a chance to warm up. This caused a lean fuel mixture and contributed to the Tercel's hesitation and surge problems during warmup.

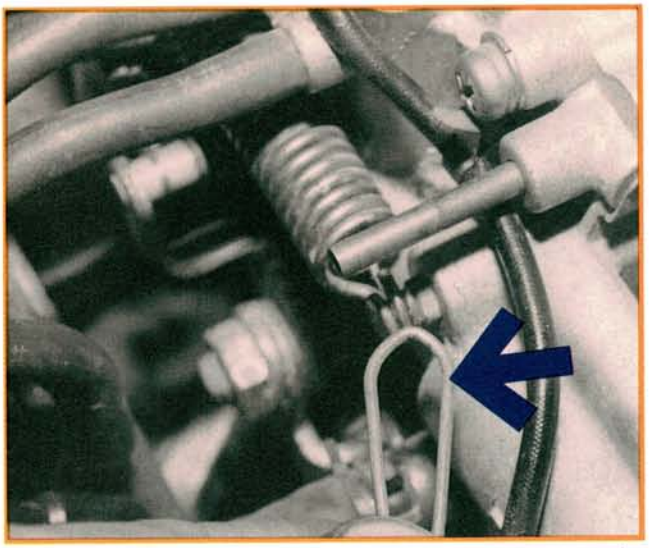


The new cold enrichment rod that's included in the field fix kit has a slightly different stepped shoulder design. The new design keeps the compensator passage open for a slightly longer period as the engine warms, to provide the additional enrichment necessary to prevent warmup hesitation and surge.



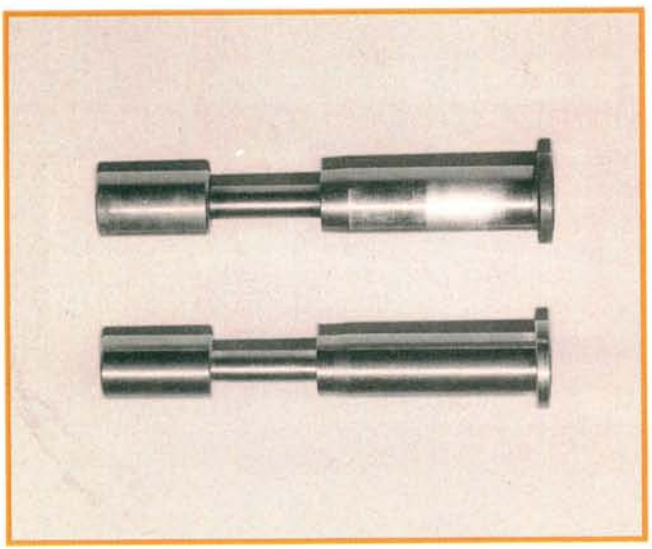
1 Cold Enrichment Rod Operation

The variable venturi carburetor uses a wax element to control the fast idle speed during engine warmup. When the engine is cold, the wax element expands and pushes the cold enrichment rod outward (arrow) to raise the idle speed. As the engine warms, the wax softens and contracts, and the engine speed gradually drops to normal idle RPM. The modified cold enrichment rod contained in the kit allows additional enrichment during warmup to overcome cold stumbling and hesitation problems.



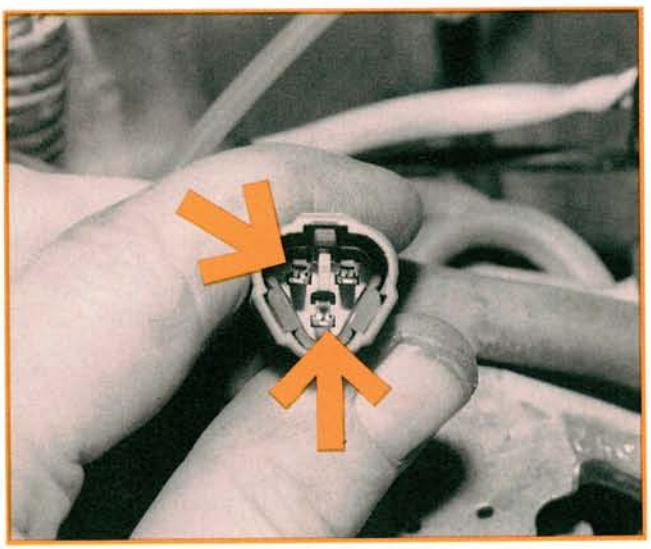
2 Cold Enrichment Rod Replacement

The engine temperature must be below 100 degrees F. If the engine is hot, the wax may leak out of the enrichment rod bore during rod replacement. Two stiff springs keep the enrichment rod in contact with the throttle linkage and also prevent the rod from slipping out of the carburetor. Make a hook from stiff wire, then pull the springs away from the carburetor mounting stud. Push the throttle linkage to the wide open throttle position, then remove the old enrichment rod.



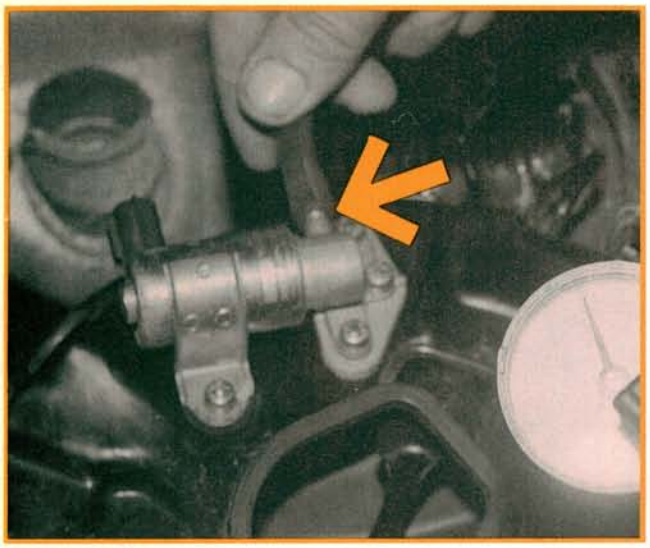
3 Enrichment Rod Modification

When the engine is cold, the fully extended enrichment rod allows the cold enrichment compensator passages inside the carburetor to open. There's a very slight difference between the old (upper) and new (lower) enrichment rods. The stepped design of the new enrichment rod allows additional enrichment through the compensator passages to prevent cold hesitation. Make sure the spring hooks do not overlap after reinstalling the return springs or they may bind.



4 Fuel Cut Solenoid Tests

Locate the fuel cut solenoid harness connector near the EGR vacuum modulator. Reconnect the battery ground cable. A cold fuel cut solenoid should click when battery voltage is applied to terminal 2 (black wire in upper left corner of connector). Never apply battery voltage to terminal 3 (also a black wire). With battery voltage applied to terminal 2, the solenoid should click when terminal 1 (white/black wire) is grounded. Replace the solenoid if it doesn't click during either test.

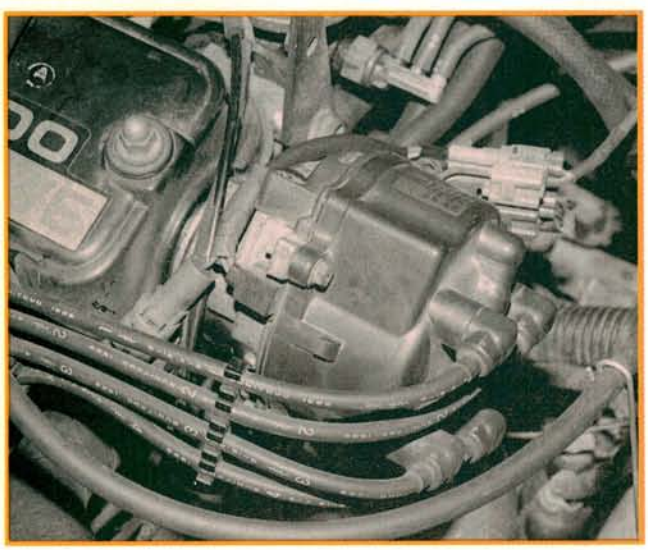


5 EBCV Test

During closed loop engine operation, the fuel system ECU constantly adjusts the fuel mixture by varying the duty cycle to the Electronic Bleed Control Valve (EBCV). The EBCV changes the mixture by metering a controlled amount of air into a carburetor air bleed port. To test the EBCV, attach a vacuum pump hose to the vacuum port on the side of the EBCV as shown. Apply vacuum to the EBCV. If the EBCV doesn't hold vacuum or leaks down slowly, replace it.

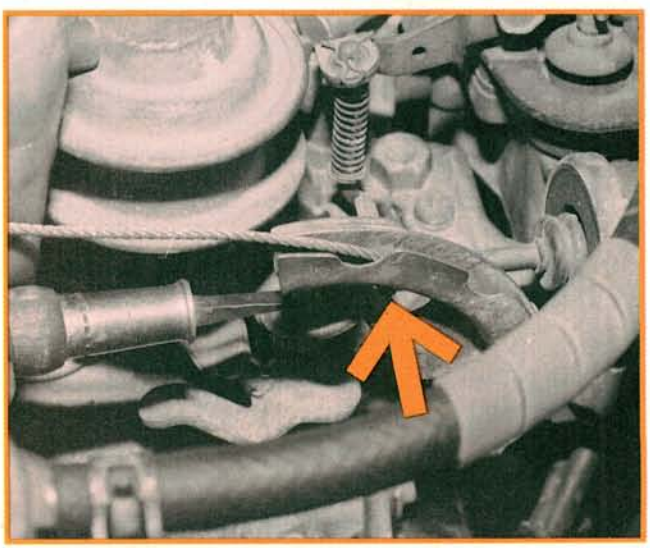
6 Final Engine Adjustments

The final engine adjustments should be made with the air cleaner reinstalled on the carburetor. Fish the vacuum hose from VCV-1 through the air cleaner grommet and attach the hose to the brass carburetor air bleed tube we installed earlier. Reattach all other remaining vacuum hoses, refill the engine coolant, reconnect the battery, then run the engine until it reaches normal operating temperature.



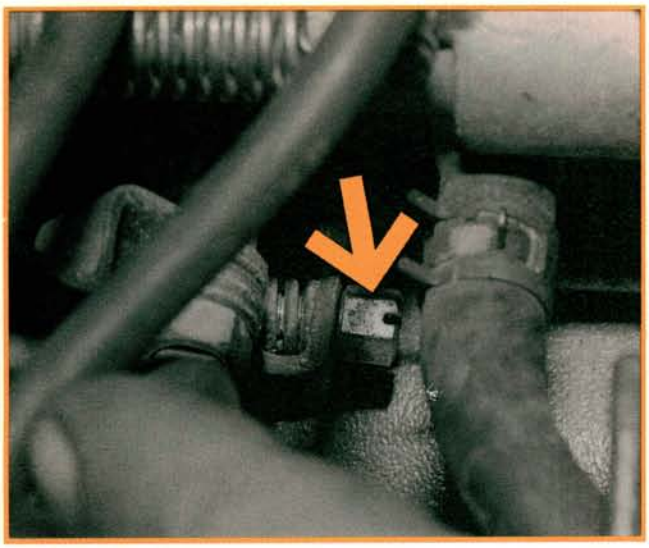
7 Setting Ignition Timing

Disconnect the vacuum hose from the inner distributor vacuum advance canister. With the engine idling at the specified RPM (check the underhood emissions sticker for the correct RPM for your model), the timing should be 3 degrees BTDC. If necessary, loosen the distributor bolts and turn the distributor to align the timing marks. Reconnect the vacuum advance hose. The ignition timing should advance to 12-18 degrees BTDC when the distributor vacuum advance hose is reconnected.



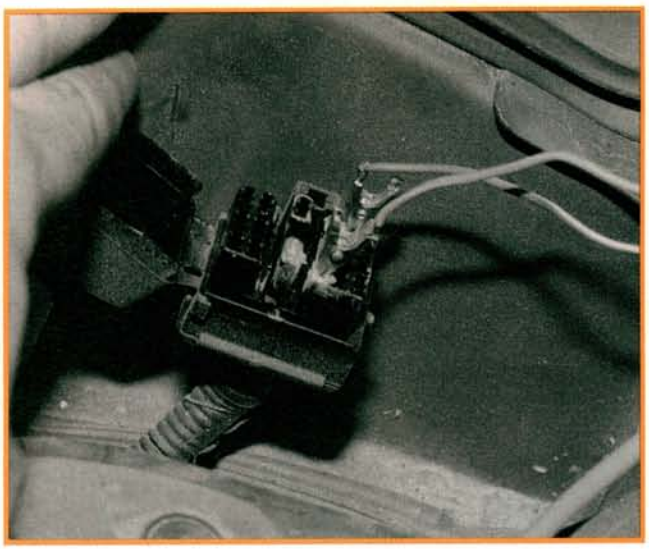
8 Adjusting Base Idle Speed

It's very difficult to see and reach the carburetor adjustment screws with the air cleaner installed, so we removed it for our photographs. If you do the same, make sure all of the appropriate air cleaner and carburetor vacuum hoses are either attached or plugged before you begin. Open hoses will affect you readings. Adjust the base idle speed in neutral to 900 RPM for automatics and 700 RPM for manuals using the idle speed screw on the left side of the carburetor (arrow).



9 Adjusting Fast Idle Speed

Disconnect the vacuum hose from the EGR valve and plug the hose end. While holding the throttle valve open, set the fast idle adjusting cam on the right side of the carburetor, then release the throttle valve. Start the engine and check the fast idle speed. Fast idle speed is 2800 RPM for automatics and 3000 RPM for manuals. If necessary, adjust the fast idle speed by turning the fast idle adjustment screw with a wrench (arrow). Reconnect the EGR valve vacuum hose when you're done.

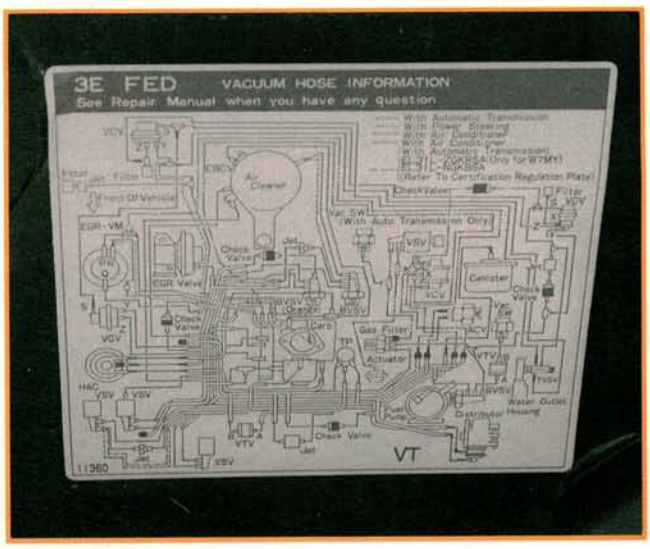


10 Check Connector

Connect a voltmeter to the vehicle Check Connector to check the throttle position switch adjustment and oxygen sensor operation. Connect the positive voltmeter probe to terminal VF and the negative probe to terminal E1. Also connect a tachometer to the engine, then race the engine at 2500 RPM for about 30 seconds. If the voltage swings from 1-4 volts at this speed, the engine is in closed loop and the oxygen sensor is operating normally.

11 Adjusting Throttle Position Switch

The throttle position switch (arrow) is an on/off switch. As the throttle opens, the switch closes to signal the ECU to begin feedback operation. This sudden transition from open to closed loop can cause driveability problems, so we'll raise the transition speed from 1400 to 2000 RPM. Slowly open the throttle while watching both meters. When the voltmeter starts swinging from 1-4 volts, the throttle switch has closed. Tighten the TPS screw to raise the feedback RPM, or loosen the screw to drop it.



12 Emissions Label

We've made some major changes to the vacuum hose routing and added a few new components, so a new emissions sticker is certainly a good idea. Remove the old sticker to avoid later confusion and install the new sticker from the kit. Road test the vehicle to check for coolant leaks and also for any signs of hot surge. If possible, the car should be kept overnight or allowed to cool completely to make sure the field fix kit has taken care of the other cold driveability problems.