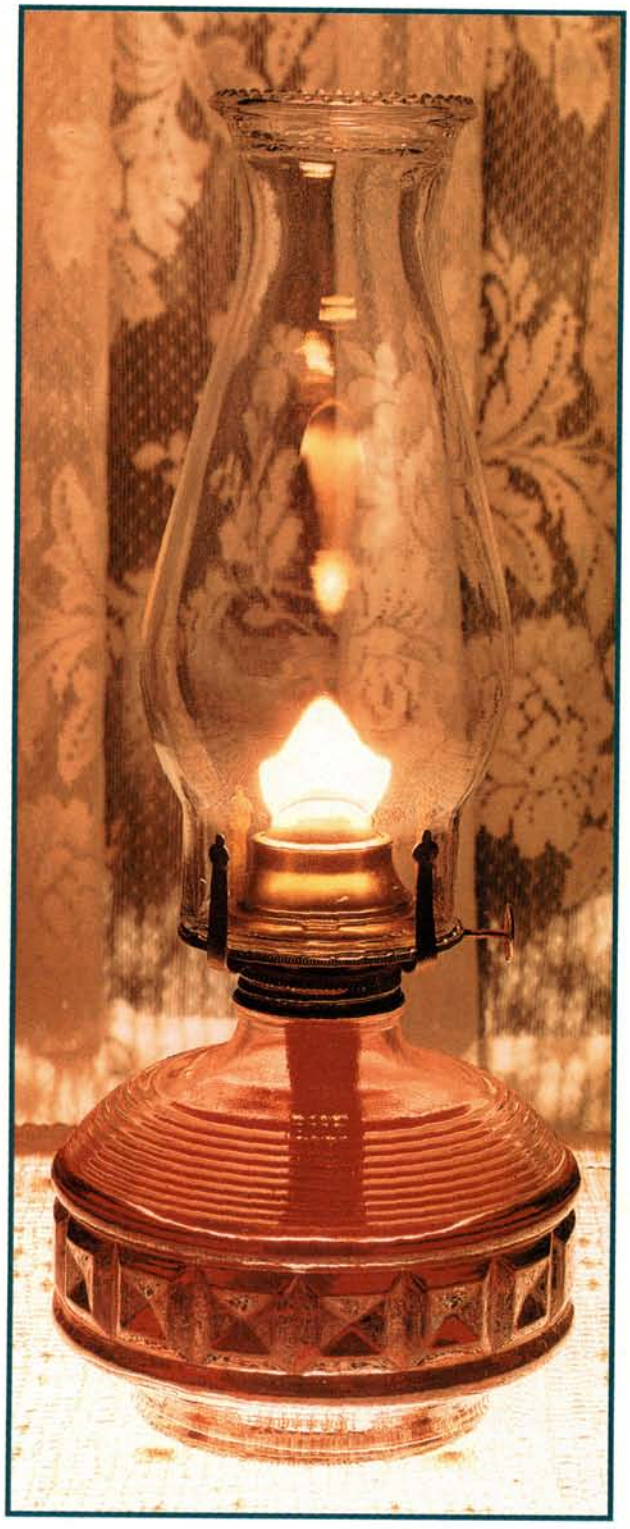
IMPORT SERVICE

Driveability Clinic



Adjusting Fuel Mixtures

Consider this simple fact - no mass-produced 1994 automobile, import or domestic, will be equipped with a carburetor. All of the carburetors are gone. Do you remember when fuel injected engines were still in the minority and carburetors ruled the road? It doesn't seem like it was that long ago, does it?

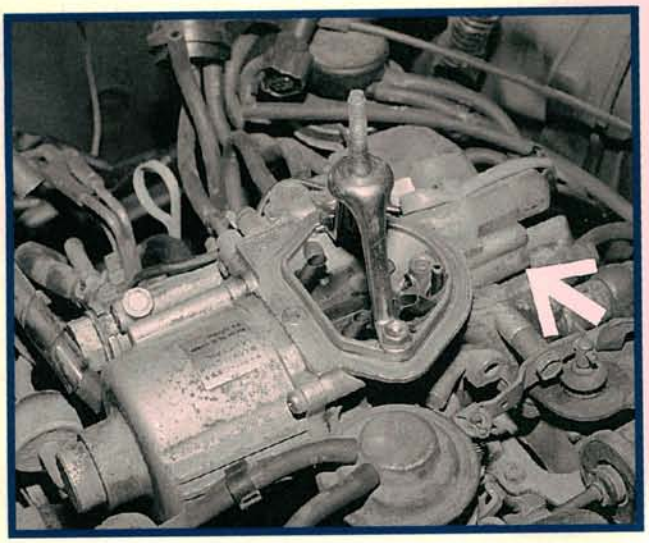
Not to get too nostalgic, but adjusting the fuel mixture used to be simple. Every major tune up included an idle mixture adjustment. Then manufacturers started putting plastic anti-tamper caps over their carburetor mixture adjusting screws. Many of us took this as an affront to our professional dignity. Didn't they think we knew what we were doing?

To make sure the vehicle would pass tougher emissions standards, the manufacturers were forced to set their fuel mixtures extra lean. You could almost always make a car run a little better, just by removing the anti-tamper cap and richening the mixture. Unfortunately, lots of DIYers figured this out, too. Most of them didn't have an exhaust gas analyzer to check the results of their adjustments, so recessed mixture adjustment screws and hardened anti-tamper plugs became necessary to discourage their unauthorized adjustments.

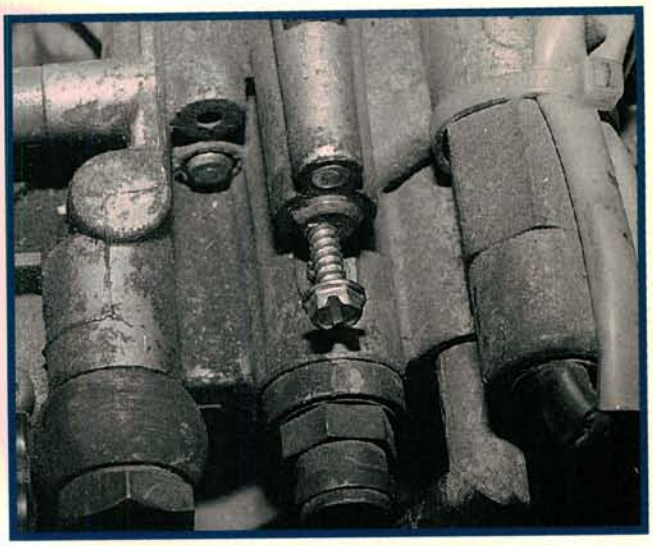
In an earlier pair of articles, we demonstrated a carburetor modification procedure to overcome some driveability problems on a 1989 Toyota Tercel (November-December 1992). Even after the modification was complete, idle quality and off-idle performance still weren't as good as they had been when the vehicle was new. Because of this, we have decided to remove the carburetor's anti-tamper plug, some 115,000 miles after it was installed at the factory.

At first glance, it doesn't look like the Tercel's constant velocity carburetor even has a mixture adjustment screw. The screw's location and its adjustment procedure are both a little out of the ordinary. We'll take you through this constant velocity carburetor's "lean drop" idle mixture adjustment, as well as the curb, throttle positioner, and fast idle speed adjustments in the following photo captions.

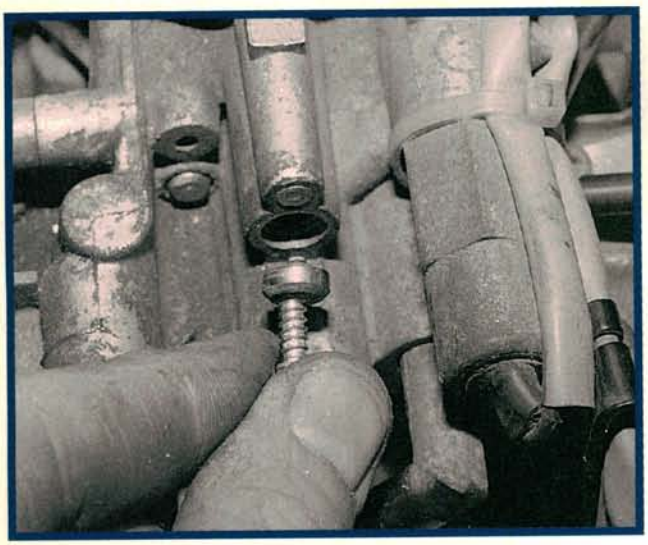
— By Karl Seyfert



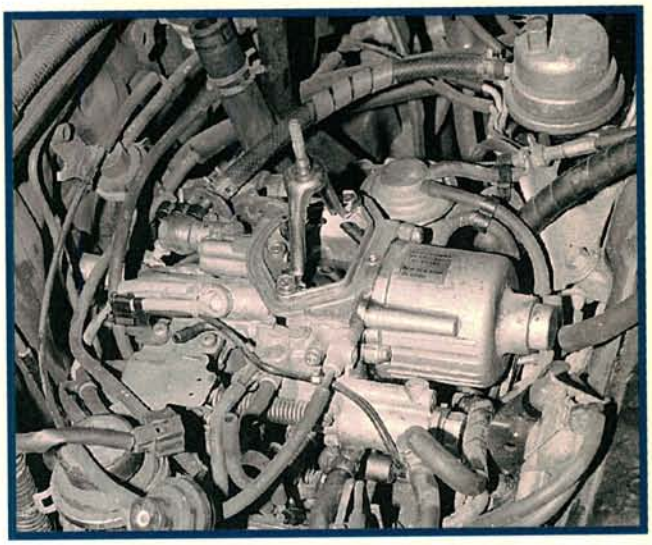
1 The carburetor's mixture adjusting screw (MAS) is located near the top of the carburetor (arrow), not in the throttle base where we're accustomed to finding it. Even though the MAS is on top of the carburetor, carburetor removal is going to be the only way to get a clear shot at the anti-tamper plug with a drill. There's a healthy crop of vacuum lines and other goodies attached to the carburetor. Unless you have a photographic memory, make notes before you start pulling hoses off.



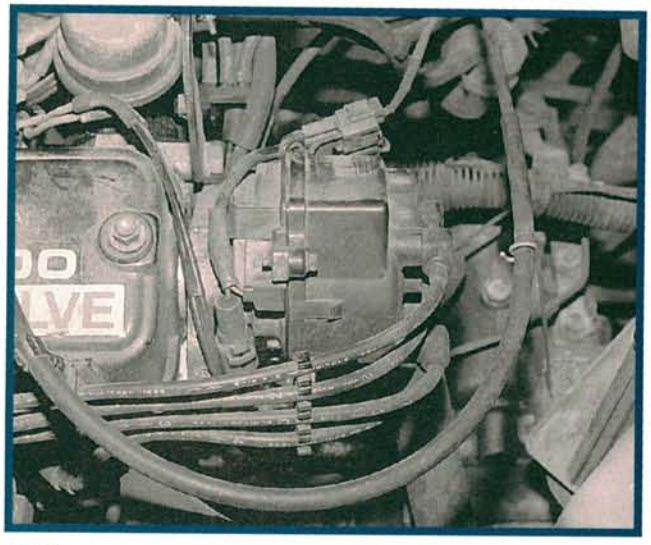
2 We center-punched the anti-tamper plug, then drilled an $^{1}/_{8}$-inch hole in the plug. There's 1 mm clearance between the plug and the MAS, so don't get carried away with the drill. Snagging the MAS with the drill bit may turn the MAS inward, then break the tip off the drill bit. Carefully thread a self-tapping screw into the plug hole. This may force the plug out as the screw bottoms on the MAS. If not, use a chisel, punch, or slide hammer to remove the shallow plug and screw.



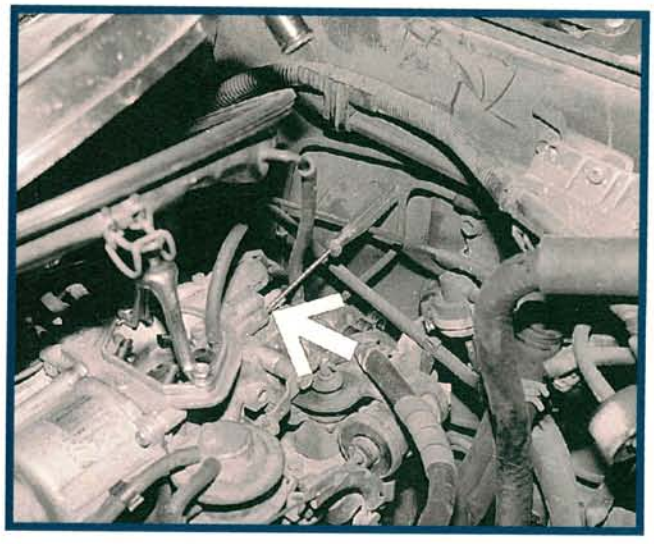
3 In spite of your best efforts, the drill bit or sheet metal screw may have disturbed the MAS adjustment. Before reinstalling the carburetor, return the MAS to its base setting by measuring the distance from the adjusting screw's head to the outer surface of the carburetor casting. A measurement of 3.5 mm (0.138 inch) will make the following steps of the adjustment easier. Don't damage the MAS screw tip by overtightening and bottoming the screw.



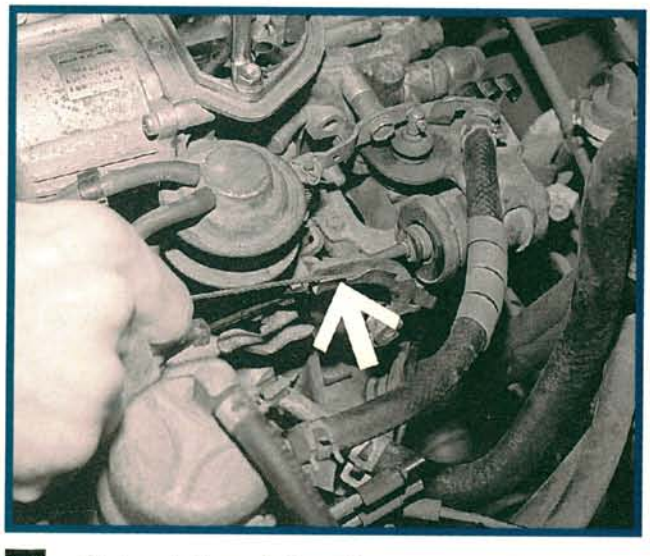
4 Replace the base gasket if it was damaged during the carburetor removal, then reinstall the carburetor. All of the following tests and adjustments must be done with vacuum hoses, lines, electrical connections, and the air cleaner properly installed to simulate normal engine operation. This doesn't leave room to reach the adjustment screws. We settled for hooking everything back up, then tilting the air cleaner off to the side for adjustment screw access.



5 We want the engine as close to "normal" as possible before we attempt any of our adjustments. Shift the transmission to neutral, apply the parking brake, start the engine, and allow it to reach operating temperature. The carburetor has no choke plate, so idle speed drops gradually as the engine warms and the enrichment devices go "off line." Let the cooling fan cycle at least once. All accessories should be turned off. Refer to the underhood sticker, then check the ignition timing.



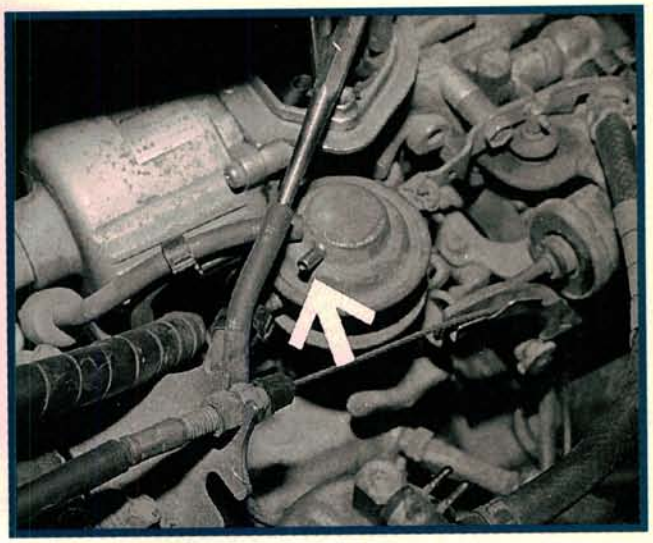
6 Unbelievably, this 1989 carburetor has no mixture control solenoid or any other feedback computer control over the fuel mixture. That's why correct MAS adjustment is so important to overall emissions. Slowly turn the MAS counterclockwise until the idle speed has reached its highest reading. Move slowly while watching the tachometer, it doesn't take much movement to affect the idle speed. Now slowly turn the MAS clockwise, stopping just before the idle speed begins to fall.



7 We've richened the idle mixture, so the idle speed has probably risen, too. Locate the idle speed screw on the left side of the carburetor, then lower the idle speed to 750 RPM for manual transmission models or 950 RPM for automatics. We found the idle speed adjustment screw to be especially touchy. A slight adjustment would shoot us 50 RPM over the target RPM, then a second adjustment would drop us 50 RPM below. Allow the engine speed to stabilize after each adjustment.

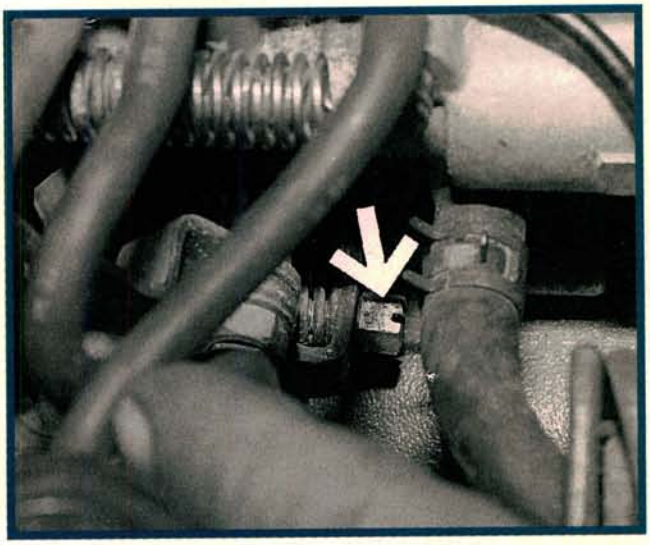
8 Back to the MAS. Again try to improve the idle quality and increase the idle speed by turning the MAS. We're down to very fine adjustments, so turn the MAS slowly. Changes in your adjustment may take a second or two to register on the tachometer. If the engine has been idling for an extended period of time, blip the throttle a couple of times every few minutes to "normalize" the idle speed. Let it settle back to idle, then continue with your MAS adjustment.

9 Bring the idle speed back to 750 RPM for manuals and 950 RPM for automatics (both in neutral) using the idle speed screw. For the lean drop segment of our MAS adjustment, slowly turn the MAS clockwise until the idle speed drops to 700 RPM (900 RPM for automatics). Again, we found it necessary to blip the throttle a few times to find the true idle speed. There was a 10-20 RPM change in the idle speed each time the engine settled down, probably due to worn throttle shaft bushings.



10 The throttle positioner, or TP, holds the throttle open slightly during closed throttle deceleration. To make the first step TP adjustment, disconnect and plug the vacuum hose from the upper TP diaphragm. Disconnect and plug the vacuum hose from the EGR valve. Turn the TP adjusting screw at the bottom of the throttle bell crank to set the first step TP adjustment to 1100 RPM. The screw's fine threads and small head are easily damaged. Lube the screw before adjustment.

11 Reconnect the upper TP chamber vacuum hose, then disconnect and plug the lower chamber TP vacuum hose. The second step TP setting speed should be 1800-2200 RPM. This adjustment is less precise because it depends on the accuracy of the first step adjustment. If the second step TP adjustment is out of range, repeat the first step TP adjustment, then recheck the second step speed. Reconnect the TP chamber vacuum hoses after completing these adjustments.



12 Go to the other end of the throttle shaft for the fast idle speed adjustment. Start the engine. While holding the throttle valve open slightly, set the fast idle adjusting cam and release the throttle valve. Fast idle speed should be 3000 RPM for manuals and 2800 RPM for automatics. If the fast idle speed is out of range, use a wrench to slowly turn the fast idle adjusting screw. The cooling fan must be off during this step. Reconnect the EGR vacuum hose after completing the adjustment.