Mercedes-Benz EHA Adjustment

In some ways, cars are like people. They each have their own character traits, and more than a few flaws in their personalities. Through our experience in dealing with many different makes and models (as well as many different people and personalities), we have learned the little tricks and tweaks that are particular to each. Each requires slightly different handling to keep them happy. Mercedes-Benz vehicles (and the people who drive them), demand the best. Take the time to learn the little things that make these vehicles perform to their owners' high expectations, and you will have many happy customers.

In the first two parts of our look at Bosch CIS and CIS-E Fuel Injection, we examined the basics of operation, testing, and adjustments. In this article we will solve some of the most common complaints associated with the Mercedes-Benz 300E (124 chassis) equipped with this system. Our subject model was built during June of 1989, but the "tweaks" can be applied to most mid 1980s to 1990 models.

As with most vehicle manufacturers, Mercedes-Benz recommends the use of a special tester to set up the air/fuel ratio. The Bosch KDJE-P 600 is a simple on/off ratio tester. This tester attaches directly to the diagnostic connector and reads the digital response of the ECU as it watches for changes in the oxygen sensor voltage. This signal is converted by the Bosch KDJE-P 600 back to an analog signal to produce a percentage reading on the meter. The unit is simple to use and fairly accurate. However, due to the fact that most of us can't afford to invest in every dedicated tester from every manufacturer, we will use some alternative methods and tools.

The Fluke 98 ScopeMeter Series II used in our photos has the ability to simultaneously display a square wave pattern and the equivalent duty cycle percentage. This gives us a more accurate picture of what is going on in the system, and the ability to do some finer "tweaking." The most common complaints received on this model have to do with cold start/stall, hot re-start, and rough idle. Most of these problems can be cured by simply taking the time to properly adjust the base settings.

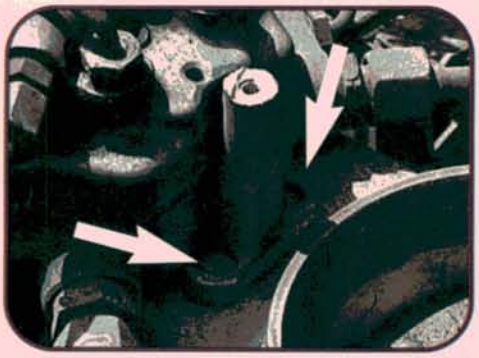
Before we proceed, be sure you have checked the basics. In our case, we know that the engine is mechanically sound, the injectors have been cleaned or replaced, the intake system and valves have been cleaned and de-carbonized, and we have a quality brand of fuel in the tank. It is important to note that a common cause of rough idle on any CIS vehicle is mismatched injector flow. All injectors should be matched for flow rate and spray pattern beforehand. You say you've done all that, but the engine still does not start or run like you know it should? What else might have been overlooked?

How about the O_2 sensor? If the vehicle has over 60,000 miles on the speedo, it is a very good bet the O_2 sensor is getting tired. This system is very dependent on the O_2 sensor signal, and a lazy or dead sensor will wreak havoc. The system can not and will not function properly without a proper O_2 signal. By reading the control unit's response to the oxygen sensor signal, we will make the fine adjustments necessary to cure 99 percent of the driveability complaints associated with these vehicles.

—By Pat Etzwiler

1

The tamper-proof plug must be removed before adjustment. Mercedes recommends removing and replacing the complete adjustment tower. We chose to cut the top 10 mm off the tower. Don't allow filings to get into the intake system or fuel distributor, and remove *just* 10 mm of material.



2

If you're a purist, the dealer kit is complete with a new anti-tamper plug. Carefully drill out the tower attachment screws (arrows), being careful not to let any shavings fall into the intake or fuel distributor. Install the tower, make your adjustments, then reseal the adjustment with a new tamper-proof plug.

3

Cutting the adjustment tower below the tamper-proof plug allows access to the adjustment screw. It's a spring-loaded adjuster with a 3 mm Allen™ head. Depress the spring to engage the adjustment screw below. The adjustment is very sensitive. A little move produces a big change in the reading.

4

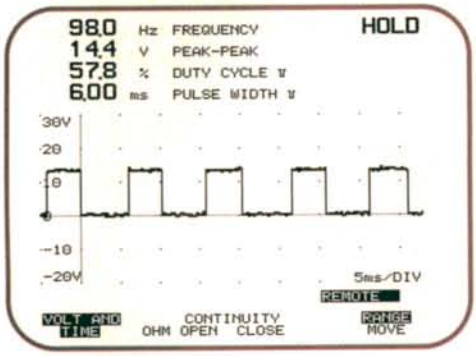
Locate the round vehicle diagnostic connector on the left inner fender panel. To connect a DMM or scope, attach the positive test lead to pin #3 , using a small bullet-type connector. Connect the negative lead to any good chassis ground. We're ready to proceed with the adjustments.

5

Set the DMM or scope to VDC, then turn the key ON, engine OFF (KOEO). Look for 2.5-5.0 VDC at pin #3. If not, check for broken wires or no power to the system from the ECU. The over-voltage protection relay (located behind the battery compartment) may be defective or a fuse may be blown.

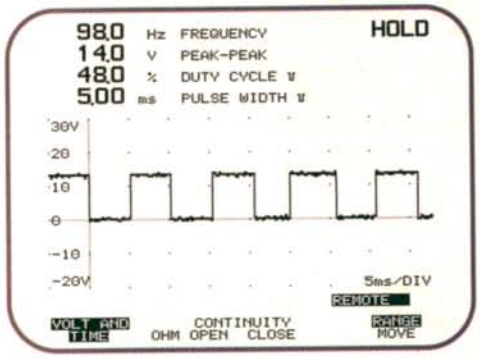
6

After modifying the adjustment tower and hooking up the scope, we reinstalled the air cleaner. All adjustments must be made with the air cleaner installed. Disconnect and plug the purge valve at the throttle valve assembly. Now run the engine at idle speed until it reaches operating temperature.



7

Snap the throttle once, then hold engine speed at 2500 RPM to warm the O_2 sensor. Check the waveform for any pattern distortion, as well as the duty cycle displayed at the top. Return the engine to idle. This unit was reading 57.8% duty at idle, which is too lean for our purposes.



8

Insert a 3 mm adjustment tool through the hole in the air cleaner. Give the system time to respond after each adjustment. Our goal is a duty cycle of approximately 50 percent. 48 ± 1 percent gives the best driveability quality in our area. Vehicles and climates vary; 'tweaking' that figure is acceptable.

9

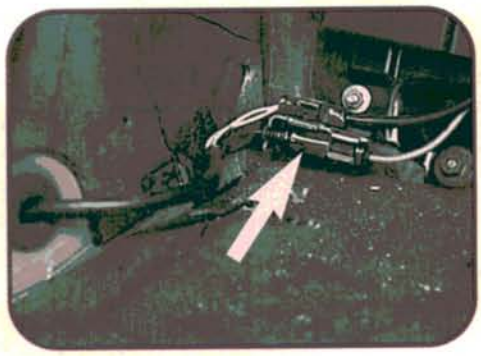
Apply the brake, then shift to DRIVE. The idle should be smooth, with a fairly steady duty cycle reading. It may drop slightly, or your idle may not be as smooth as you want. Repeat the adjustment until you are happy with the results. This one was 47.7 percent in DRIVE, and idled smooth as glass!

10

KOEO, the DMM at diagnostic connector pin #3 showed 3.74 VDC. KOER, the DMM shows *an average* of the ECU's digital response to the oxygen sensor signal (analog). As the voltage changes, the mA current to the EHA increases or decreases, allowing mixture control in response to the O_2 sensor signal.

11

No scope? Substitute voltage readings from a DMM. Remember, this is an *averaged* reading. The peak to peak voltage was about 14 VDC, so the 6.82 average voltage we saw means the duty cycle is a shade less than 50 percent. Switching the DMM to duty cycle confirms this—duty cycle is 49.3 percent.



12

Unplug the O_2 sensor to control unit harness connector, under the passenger carpeting (arrow). Key OFF, ground the lead *to* the control unit. Connect a DMM to the single wire *from* the O_2 sensor, then start the engine. A reading of 0.45V-1.0V (full rich) means the sensor is responding properly.