

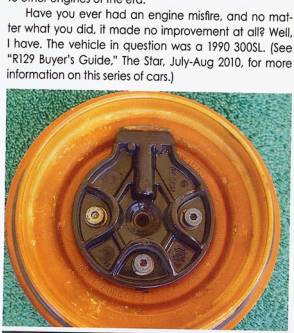


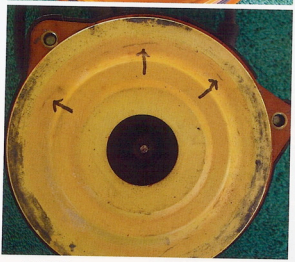
# IGNITION MISFIRING on 1990s Engines

**Early-1990s Mercedes-Benz vehicles with Continuous Injection System (CIS) engines and electronic ignition were known , unfortunately, for difficult-to-diagnose problems with engine stumbling, hesitation, and misfiring.**

The condition particularly affected the M103, M104, and M119 engines, though the remedy might well apply to other engines of the era.

Have you ever had an engine misfire, and no matter what you did, it made no improvement at all? Well, I have. The vehicle in question was a 1990 300SL. (See "R129 Buyer's Guide," The Star, July-Aug 2010, for more information on this series of cars.)





Above left: **The cap, rotor, and wires were new and looked fine.** Below left: **However, on the insulator disk behind the rotor, there were three small scratches, indicating the spark was passing through the disk to ground.**

The issue was a random misfire at idle and at cruising speeds. From the beginning, my instincts told me this was an ignition misfire, so my first step was to examine the ignition using a Sun digital oscilloscope.

Everything looked normal: good spark burn time and high voltage. Contrary to my initial instincts, I began the process of checking the basics. I started with a compression check and proceeded to test CIS fuel pressures, the Electro-Hydraulic Actuator control current, the airflow sensor plate, and run a host of other tests. The results of all the tests were normal. After hours of testing, I couldn't ignore my initial hunch. Now I'm not a proponent of throwing parts on a car for testing purposes, but in this circumstance I succumbed and replaced the plug wires, the distributor cap, and the distributor rotor, and swapped in a known good coil. To my frustration, however, there was no change. At this point I decided to hook up the vehicle to a Sun analog scope.

Voilà! I could now see the ignition fault that failed to show up on the digital scope, thus validating my instincts all along. The scope pattern was what I have seen hundreds of times: several open plug-wire resistors. Not so fast. This was a new set of wires.

Next I decided to check available voltage from the coil (the maximum voltage the coil is capable of emitting). In this case, the available voltage was approximately 28KV, or 28,000 volts. This was excellent output by any standards, because under normal operating conditions with good plugs and wires, the required voltage would be approximately 8-12KV. Then I noticed that on three of the six cylinders the available voltage was only roughly 10KV, just slightly higher than what that particular cylinder needed to fire the plug.

My first thought was a carbon track under the black plastic dust cover on the distributor cap. But the cap, rotor, and wires were new. Nevertheless, the symptom was exactly the same as for a carbon track in the distributor cap, so I removed the cap for closer inspection of the rotor, drive hub, and anything else I might have overlooked. Nothing.

My patience measurably shorter by this time, I was determined to find the gremlin lurking inside. I returned to the scope for another round of tests. Oddly enough, the cylinders that had low available voltage had moved to different cylinders. Off came the cap again for even more inspection. There had to be something I was missing.

As I inspected the rotor for the 10th time, I looked at the insulator disk that resides behind the rotor. On it, I discovered three very small scratches on the back similar to 10mm fine-lead pencil marks. As I matched the disk with the cap, I also noticed these marks were at the same location as the terminals on the inside of the distributor cap. (See photos.)

The only way these marks could have been made was by the ignition spark passing *through* the insulator disk directly to ground. I also realized that this condition only occurred when the voltage demands of that particular cylinder were slightly higher than what was required to fire the cylinder.

Because the insulator disk is not indexed to a certain fixed position, whenever the insulator was removed and replaced, the misfiring could move randomly to different cylinders. This is one part of the ignition system that is often overlooked, and I can't help but wonder how many other vehicles are affected by this seemingly insignificant component. After I replaced the insulator disk, the client let me know that his car has not run this well in years.

As mentioned above, this particular issue can affect many 1990s-era engines. The two lessons I learned: (1) You will find more detail with an analog scope than a digital scope, and (2) don't overlook that *seemingly* insignificant insulator disk.

***Ken Adams is a Mercedes-Benz Master Technician at Park Avenue Motors in Palo Alto, www.parkavenuemotors.com.***