



TECH TIPS



AUDI/ VOLKSWAGEN DIAGNOSIS: LEAN MIXTURE CODES, NO APPARENT DRIVABILITY ISSUES

Models affected:

Audi

A4, A6, A8

Volkswagen

Golf, Jetta, Passat, and New Beetle

With 1.8T, 2.0, 2.8/3.2 VR-6, 2.8 V6 90° and 4.2 V8.

Codes stored

SAE	VAG
P0133	16512
O2 sensor: slow response Bank 1	
P0139	16523
O2 sensor: slow response, Bank 2	
P0170/P0173	16554
Fuel trim malfunction Bank 1/2	
P0171/P0174	16555/16558
Bank 1/2 fuel trim lean	
P1136/P1138	17544/17546
Bank 1/2 long term trim at lean limit	
P1141-P1143	17549-17551
Load calculation cross-check limits	

All of these faults listed above can be the result of a Mass Airflow Sensor (MAF) that has a contaminated/damaged hot film element. If a MAF sensor is not responding with the correct air density/volume calculation, then the ECU cannot calculate the proper amount of fuel, and the O2 sensor will generate low voltage. In some cases, the ECU will set O2 sensor low activity codes.

Contrary to popular belief, the ECU will not typically set a MAF code, as it is sending a valid but incorrect signal.

The first step in the diagnosis for this vehicle is to check for physical external

vacuum leaks while monitoring the fuel trim data. The OBD-II generic mode on the scan tool is best to use for simplification. Do not reset the faults or the fuel trims at this time.

Vacuum leaks are typically found at the fuel pressure regulator hose, defective crankcase ventilation valves (there are several on 1.8Ts), canister purge valves, and brake booster hoses/lines. Once you have corrected any leaks, you can use the fuel trim short-term data to determine if you have cured the issue. If a leak was the cause, then the short-term fuel trim data will become negative, attempting to pull the mixture to a more lean condition, as the prevailing high (above 10%) fuel trim is now too rich to keep the engine running at the appropriate mixture.

The next step is to verify proper fuel pressure. Remember, just because you do not have a drivability problem doesn't mean your fuel supply system is up to snuff.

If fuel pressure is good, and any vacuum leaks are repaired or not found, yet the fuel trim data has not changed much, then it's time to take a close look at the MAF sensor.

First, check the meter's signal at idle. A good running engine should yield the following results in grams per second at idle, with no load. These are known good values, taken from real-world applications.

1.8 Turbo	3-5 GPS
2.0	3-4 "
2.8 VR-6	4-5 "
2.8 90°V-6	4-5 "
4.2 V8	5-7 "

Sensor readings that do not fall into this range, are out of spec and must be replaced.

The final step in diagnosing the lean running condition is to check the MAF sensor's calculated load value at wide open throttle. This test is simple; have a helper watch the scan tool as you drive it down the road with the pedal all the way to the floor. If you do not see at least 95% load, the MAF sensor is at fault.

The Bosch hot film MAF that Audi/VW uses in these applications is extremely susceptible to contamination from silicone (detailing products), silicates (dust), and oil (usually from a bad crankcase breather element or aftermarket open-style air filter.) They usually do not respond to cleaning, as the hot film will fuse contaminants to its surface, and then effectively insulate itself from airflow.

The Hitachi MAF sensor seems to suffer from these issues less, but the same diagnosis still applies.

After the MAF sensor has been replaced, be sure to double-check your fuel trim to make sure the short-term is in the negative, pulling down the high long-term trim. You can, at this point, reset your fault codes and take it for a test drive.

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