

Diagnostic Codes & Self-Adaption

Diagnostic trouble code (DTC) readout:

The engine control module (N3/4) for the LH-SFI, HFM-SFI and ME-SFI systems are equipped with diagnostic trouble code (DTC) memory. Malfunctions are recognized and stored as trouble codes and are distinguished as follows:

- u Malfunctions which are constantly present,
- u Malfunctions which occur longer than a pre determined number of seconds,
- u Intermittent contact malfunctions which have occurred 5x during a trip.

The DTC memory remains active even if the vehicle's battery is disconnected.

Malfunctions which are no longer present, are automatically erased again after a maximum of 19 trips.

Under HFM-SFI a **TRIP** has occurred if:

- u Engine running more than 5 minutes
- u Vehicle speed >4 km/h (2.5 mph),
- u Engine speed >700 rpm,
- u Engine shut off for 30 seconds.

Under ME-SFI a **TRIP** is

- u Engine running for more than 20 minutes,
- u Engine temperature is greater than -7 degrees C,
- u Engine speed is greater than 500 RPM,

The stored diagnostic trouble codes (DTCs) can be read at the 16 (124 E-class) or 38 pin data link connector (X11/4) with the ignition switched "ON" or with the "engine running".

Diagnosis via an on-off ratio readout has been eliminated in all models.

Mixture Adaptation:

The Lambda control system precisely determines fuel injection duration so that the fuel/air ratio is consistently kept at Lambda equal 1 (Lambda=1 is 14.7 kg air per 1 kg fuel) under all operating conditions.

Long Term Adaptation (Additive), also called Long Term Fuel Trim (LTF), is calculated while the engine is at idle. Maximum allowable correction to rich or lean is ± 1.0 msec of the injection duration at idle.

Short Term Adaptation (Multiplicative), also called Short Term Fuel Trim (STF), is calculated while the engine is at Low Partial Load and at High Partial Load. Maximum allowable correction to rich or lean is $\pm 32\%$ of the injection duration at Low or High partial load.

Under ME-SFI the engine control will automatically adapt itself again (ME injection) over the course of **10 TRIPS**.

Should a malfunction occur in the form of:

- u Intake air leaks
- u Injector defects or carbon build-up,
- u Air Flow Sensor defects
- u Pressure regulator defects, such as a blown diaphragm.
- u Fuel tank purge control valve defects or EVAP system leaks.]
- u EGR defects
- u Vacuum leaks of any kind.
- u Mechanical engine wear, such as, chipped valves or leaking rings.

The engine control module automatically performs a mixture adjustment. The degree of correction is calculated constantly and stored in KAM (Keep Alive Memory) RAM. The self-adaptation is performed at idle and under partial load. Maximum correction towards rich or lean is 25%. After repair work is performed, the engine control module will automatically adapt itself again after approx. 10 trips. After eliminating a malfunction or after trial installation of an engine control module from another vehicle, the self-adaptation feature must be reset to its mean value.

"Resetting and Reactivating for BOSCH Engine Control Module Memory"

For LH & HFM systems only.

To reset and reactivate the module :

1. Read and clear all fault codes
2. After display of 1 (No faults present) short the diagnostic plug (pin 8 for 16 pin diagnostic socket, pin 4 for 38 pin diagnostic socket) to ground for 6 to 8 seconds
3. Switch ignition off and wait at least 5 seconds
4. Turn ignition on, wait minimum of 10 seconds then restart engine.

About Stored, Registered and Current Faults

Stored or Permanent Faults - These faults generally turn on the MIL (malfunction indicator lamp previously known as the Check Engine Light) and are recorded in the permanent memory of the cars system controller. Clearing these codes most often will extinguish the MIL. (See Registered Faults below.)

Registered or Pending Faults - These faults can keep the MIL on. These faults are recorded in the temporary memory of the of the cars system controller. This temporary memory records the number of times a component fails. When a certain number of failures has occurred the fault is moved to permanent storage and the Check Engine Light (MIL) will be illuminated. On cars equipped with Fault Registers the Check Engine Light may stay on after the Stored or Permanent Fault has been erased if another occurrence of the fault has happened since the original Permanent Fault was stored. To ensure the MIL is extinguished, erase the Stored and Registered faults.

Current or Actual Faults - These faults are detected while the car is running at idle or speed. They represent components currently failing or, in the case of HFM and LH systems, components not present. These codes cannot be erased, and are only meaningful with the ignition on and the engine running. Codes found in this system with the KOEO have no meaning. Components not present on the vehicle may be flagged as failing by the cars internal diagnostics due to the generic nature of the cars software. This is particularly true in C-Class (202) cars.

Check Engine Light (MIL) Diagnosis

Mercedes S(140), SL(129), E(124, 210) and C(202) class have multiple systems which can turn on an Check Engine Light. All related systems must be tested for codes and repaired before the light will extinguish.

129 LH	LH (pin 4 & 5) EA/CC/ISC (pin 7), BM (pin 8), DI (pin 17 & 18) and DM (pin 19)
140 LH	LH (pin 4) EA/CC/ISC (pin 7), BM (pin 8), DI (pin 17) and DM (pin 19)
124 HFM	HFM (pin 8) EA/CC/ISC (pin 14), and DM (pin 3)
140 HFM	HFM (pin 4) EA/CC/ISC (pin 7), BM (pin 8), DI (pin 17) and DM (pin 19)
202 HFM	HFM (pin 4) EA/CC/ISC (pin 7) (except C220) and DM (pin 19)
210 HFM	HFM (pin 4) EA/CC/ISC (pin 7), BM (pin 8), DI (pin 17) and DM (pin 19)

Note: ME-SFI injected integrate all these systems in one controller.