Diagnosis - Diagnostic Trouble Code (DTC) Memory

Preliminary work: . . . . . Engine Test, Adjustment, Engines (SMS, Job No. 07-1100)

⚠ WARNING!
Risk of severe injury when touching ignition parts which produce high voltages. Do not touch igntion components.
Persons with heart pacemakers are not to perform repairs on this type of ignition system..

Electronic ignition systems produce dangerous high voltages on both the primary circuit and the secondary (ignition) circuits. Due to the high voltages produced, contact with any of the voltage carrying components can be dangerous to your health (burns, heart palpatations, cardiac arrest etc).

- Igntion must be turned OFF prior to performing any repair work on the igntion system.
- Do not come in contact or remove with any of the ignition components while the engine is cranking or idling.
- Wear rubber soled shoes.
- Disconnect connectors for CKP sensor at sensor or control module.
- If repairs require that the ignition be turned on, then dangerous voltages will be present through out the entire ignition system.
- No exposed metal connectors or sending units may be installed in the ignition wires.

⚠ WARNING!
Risk of fatal injury from being pulled into rotating vehicle parts.
Do not reach into rotating parts.
Wear closed and tight-fitting work clothes.
Protect vicinity of rotating vehicle components from unauthorized access.

⚠ WARNING!
Risk of explosion from fuel igniting, risk of poisoning from inhaling and swallowing fuel as well as risk of injury to eyes and skin from contact with fuel.
No fire, sparks, exposed flames or smoking.
Pour fuels only into suitable and appropriately marked containers.
Wear protective clothing when handling fuel.
Possible hazards
Risk of explosion, poisoning and injury
Fuels are highly inflammable and toxic if inhaled. Fuel may cause skin damage. Contact with gasoline fuel, for example, removes the natural oils on the skin. Fuel vapors are explosive, invisible and spread out at floor level. They are toxic if inhaled and have a narcotic effect in high concentrations.

Protective measures/guidelines

- Pay attention to national safety regulations and provisions.
- No fire, sparks, exposed flames or smoking.
- Ensure that the place of work is adequately ventilated.
- Never drain or pour in fuels over assembly pits.
- Store drained fuel in suitable and sealed containers.
- Immediately eliminate any fuel spills which have been spilled out of the container.

Continued on next page:

Diagnosis - Diagnostic Trouble Code (DTC) Memory

Conducting work on a vehicle with exposed flame
(e.g. welding etc.)

- Prior to commencing such work, remove appropriate parts of the fuel system and seal open fuel lines with plugs.

First-aid measures

- Clean contaminated/exposed skin with water and soap.
- Change contaminated clothing as quickly as possible.
- If fuel gets into the eyes, rinse out eyes immediately with water, and contact a doctor, if necessary.

To Avoid Damage to the Ignition System

- To avoid damage to the engine control module, connect/disconnect the control module connectors only with the ignition: **OFF**.
- Circuit 1 of the ignition coil may not be shorted to ground, e.g. theft deterence.
- Only original equipment should be installed in the ignition system.
- Do not operate the ignition system at cranking speed unless the entire igntion harness is connected.
- Do not perform any tests (grounding of ignition cable 4 disconnecting a spark plug connector or pulling cable 4 out of the ignition coil) at cranking or idle speed.
- The high output side of the ignition system must carry at least 2 kΩ of load (spark plug connector).
- If assisting a disabled vehicle and it becomes necessary to perform an igntion spark test, perform this test only on one ignition/sark plug. Ensure a good ground connection to the spark plug.
- ME - SFI: the ignition system is to be turned OFF, when cranking engine to perform compression tests, additionally, it is necessary to disconnect connector 2 from the control module.

ⓘ Engine 120 has separate ignition and fuel injection system.

⚠
Readout via the impulse counter scan tool is not possible.

Note:
Symbol for emission related malfunctions which lead to the activation of the CHECK ENGINE MIL when a certain test cycle was performed and a fault was recognized.

Diagnosis - Diagnostic Trouble Code (DTC) Memory

Note regarding diagnostic trouble code (DTC) readout:
The engine control module (N3/10) for the ME-SFI system is equipped with diagnostic trouble code (DTC) memory. Malfunctions are recognized and stored as DTC's and are distinguished as follows:

- Malfunctions which are constantly present,
- Intermittent contact malfunctions which have occured during a trip and have been stored.

The DTC memory is erased when the vehicle's battery is disconnected.

Malfunctions which are no longer present, are automatically erased as follows:

- After three trips the "CHECK ENGINE" MIL goes out.
- After an additional 40 warm-up periods the DTC is automatically erased.
- "CHECK ENGINE" MIL is illuminated if the fault was stored on the previous driving-cycle.

A warm-up period or trip is defined as follows:

Warm-up period
- Engine coolant temperature at start < 35° C,
- Engine coolant temperature increases to > 70° C.

Trip
- Engine running for > 20 minutes,
- Engine oil temperature > – 7° C,
- Engine speed > 500 rpm,
- All emission related logic chain functions already there were checked during previous trips.

Driving-cycle (for a test) consists of:
- Engine start
- Completion of test,
- Shutting engine: OFF

The stored DTC's can be read at the data link connector (X11/4) **using the HHT only**, with the ignition switched "**ON**" or with the "engine running". Readout via an on-off ratio readout or impulse counter scan tool has been eliminated.

As required by law, the DTC's can be read out using the Generic Scan Tool, by connecting scan tool to the diagnostic connector (X11/4).

Diagnosis - Diagnostic Trouble Code (DTC) Memory

Note regarding mixture preparation self-adaptation:
The Lambda control system determines the fuel injection duration so precisely that the fuel/air ratio is kept constant at Lambda level 1 (equals 14.7 kg air to 1 kg fuel) under all operating conditions.
Should malfunctions occur in the form of:

- Intake air leaks,
- Injector wear or carbon build-up,
- Engine wear,
- Transition resistance in MAF sensor,
- Defective diaphragm pressure regulator,
- Defective purge control valve,

the engine control module (ME-SFI, 2.0) automatically performs a mixture adjustment.
The degree of correction is constantly calculated and permanently stored. The self-adaptation is performed additive at idle and multiplicative under partial load. The correction towards rich or lean is ± 1.0 milliseconds (injection duration) at idle and the factor 0.68 – 1.32 at partial load. After repair work is performed, the engine control module will automatically adapt itself again.

Note regarding drive authorization system (DAS 3):
Model Year 1998, models 202, 208 and 210
Vehicles with ME-SFI (ME 2.0) are equipped with DAS 3. DAS is activated from the DAS control module (N54/1) via the CAN data bus to the engine control module.
Upon activation of the DAS, the engine control module renders the fuel injection system inoperative. The activation or deactivation is accomplished only with the electronic ignition key. As soon as the electronic ignition key is inserted in the steering lock, the DAS control module receives a signal and activates the engine control via the CAN data bus.
The locking and unlocking of the vehicle, using the mechanical key has no effect on the DAS system.
The engine control module and the DAS control module are “married” to one another through identification codes. The identification codes can not be erased (see HHT nominal values “DAS”, menu selection 3/7).
Therefore, swapping the engine or RCL control module from one vehicle to another is not possible!

Diagnosis - Diagnostic Trouble Code (DTC) Memory

If an exchange engine control module is installed for test purposes, up to 40 start attempts can be performed before the engine and DAS control modules “marry” to one another. Prior to perfroming the first start, the engine control module must be version coded using the HHT. Additionally, the code number and VIN must be entered (see HHT nominal values “DAS”, menu selection 3/7).

Note regarding version coding:
The engine control module is equipped with a version coding feature. The coding must be performed with the Hand-Held Tester (automatically or manually, see Notes for HHT “Version coding“ 11/5) upon installation of a new control module.
The following vehicle version data must be determined for coding:

- Vehicle model,
- Engine
- Non-catalytic converter (non-TWC),
- Country version,
- 30 km/h limitation

Diagnosis - Diagnostic Trouble Code (DTC) Memory

Notes regarding automatic recognition of the mechanical end stop and wide open position of the throttle valve from the actuator:
The end stops of the throttle valve is determined by the actuator and stored in the engine control module.
After replacing the control module or actuator, the mechanical end stop and wide open position must again be determined and recorded.
Thereby allowing learned data to be erased with the HHT and new data to be learned. When the new engine control module is connected for the first time to circuit 30 (B+), the engine control module performs a self-adaptation of the actuator with the ignition "ON" (lower mechanical end stop).

Requirements for learning process:
- Selector lever in position P/N,
- Vehicle standing still,
- Engine off,
- Engine coolant temperature between 5° C and 100° C,
- Accelerator pedal not applied.

When all requirements are met, turn **ignition ON for at least 60 seconds**, then turn **ignition OFF for at least 10 seconds**.
The learned value is stored in memory, only after the first 10 start cycles, provided the voltage supply has not been interrupted. Should the battery be disconnected after the 9th start cycle, the re-learning process must be performed again.

Notes regarding VSS sensor adaption for rough running engine test:
After the replacement of the ME-SFI control module, CKP sensor (L5), starter ring gear or motor mount, a sensor adaption must be performed:
- Engine coolant temperature approx. > 70 ºC,
- Drive vehicle on road.

Vehicles up to 01/98:
- With selector lever in position 4: Increase engine rpm to approx. 2,500 rpm and then coast until engine rpm is approx. < 1,500 rpm.
- With selector lever in position 2: Increase engine rpm to approx. 6,100 rpm and then coast until engine rpm is approx. < 4,100 rpm. Again increase engine rpm to approx. 6,100 rpm and then coast until engine rpm is approx. < 3,000 rpm.
- Using the HHT, determine if VSS sensor adaption has taken place.

Vehicles as of 02/98:
- With selector lever in position 3: Increase engine rpm to approx. 2,100 rpm and then hold a 50% engine load for approx. 30 seconds.
- Using the HHT, determine if VSS sensor adaption has taken place.

Notes regarding performance/speedometer test:
Disconnecting the ESP/ASR/ETS/ABS control modules is not allowed. The engine control module and transmission control module rely on these modules to supply the VSS data via the CAN bus.

To disable the brake and engine regulation function of the ESP/ASR/ETS/ABS control modules:

Continued on 11/5

Diagnosis - Diagnostic Trouble Code (DTC) Memory

Notes regarding working with HHT:

A. Working without HHT
- Ignition: **OFF**.
- Connect HHT adapter to data link connector (X11/4).
- Bridge sockets 1 and 6.
- Engine: **Start** (BAS/ESP or BAS/ASR MIL must illuminate!).

B. Working with HHT
- Ignition: **OFF**.
- Disconnect front axle VSS sensor connector (BAS/ESP or BAS/ASR MIL must illuminate!).

When work is completed, reconnect VSS sensor connector and erase DTC's with HHT!

- **Fault search with HHT**
  Diagnostic trouble code (DTC) memory: Select "Current DTC's".
  If the actual condition changes, e.g. when wiggling a connector, the change is reported optically and acoustically so that troubleshooting can be performed directly with the HHT.

- **Loose connections**
  Loose connections are stored if they occur several times in a certain time period. Therefore, they can appear only as "Stored DTC's" and never as "Current DTC's".

- **Nominal values**
  All nominal values relative to the actual values shown on the HHT are listed in the Diagnostic Manual, Engines, Volume 1, section A.

- **Actual value for engine speed**
  For engine speed, the HHT display indicates the closed throttle speed (CTP) nominal value calculated by the control module on the left, and the rpm actual value on the right. Both values should differ from each other only slightly. Permissible tolerances are not yet determined.

- **Version coding with HHT**
  a) Before replacement of the engine control module, the existing code number must be read and stored with the HHT (menu selection 5 "Version coding"). After installation of the new control module, the previously read code number must be entered.

Note:
If returning a new control module to a PDC, the code number must be erased.

  b) If the code number can **not** be read, the vehicle equipment/version must be determined, the corresponding code number obtained from the Spare Parts Microfiche (group 54) and manually entered with the HHT.

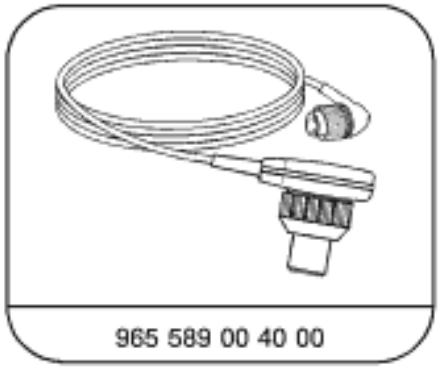
- **Drive authorization system (DAS) X**
  Upon replacement the engine control module must be version coded using the HHT. Additionally, the code number and VIN must be entered (see HHT nominal values "DAS", menu selection 3/7).

Diagnosis - Diagnostic Trouble Code (DTC) Memory

Special Tools

965 589 00 01 00

Hand-Held-Tester



965 589 00 40 00

Test cable

Diagnosis - Diagnostic Trouble Code (DTC) Memory

Connection Diagram - Hand-Held Tester (HHT)

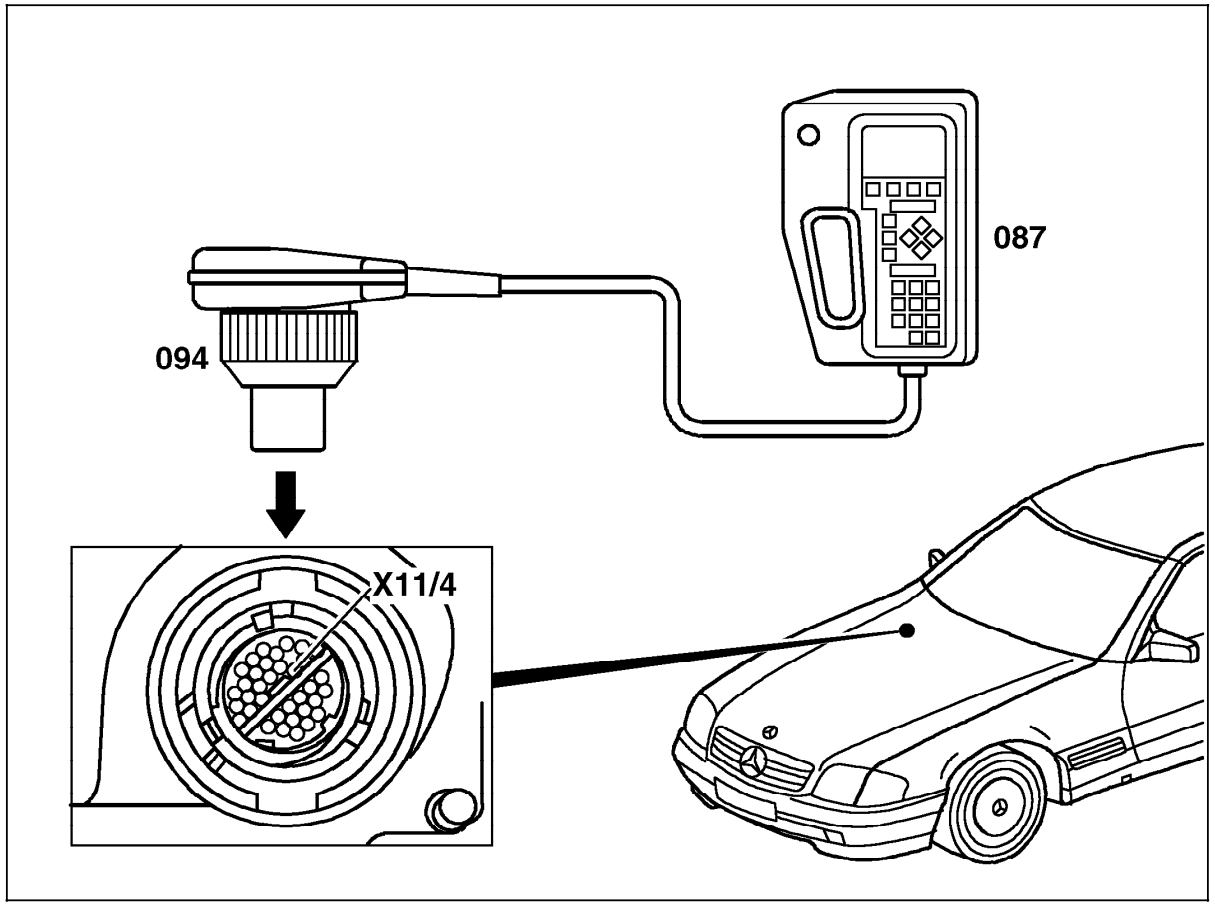
1 Connect HHT (087) with test cable (097) to data link connector (X11/4)

2. Ignition: **ON**

3. As per display in HHT:
   a) read out/erase DTC memory
   b) read out actual values
   c) perform activations
   d) program control modules

4. Disconnect HHT

Observe system specific notes, which are described in the beginning of each chapter. Erase all stored faults which come about when tests or simulations are performed, upon completion of the repairs.



P00.19-0411-06

Figure 1

087	Hand-Held Tester
094	Multiplexer cable
X11/4	Data link connector (DTC readout) (38-pole)

Diagnosis – Diagnostic Trouble Code (DTC) Memory

Prerequisites for readout of DTC memory

⚠ **WARNING!**

Risk of severe injury when touching ignition parts which produce high voltages. Do not touch igntion components.
Persons with heart pacemakers are not to perform repairs on this type of ignition system.

i

Readout via the impulse counter scan tool is not possible.

Note:

Symbol for emission related malfunctions which lead to the activation of the CHECK ENGINE MIL when a certain test cycle was performed and a fault was recognized in the prior trip cycle. The CHECK ENGINE MIL will illuminate immediately if a "TWC damaging" misfire is found.

Preparation for Test:

1. Connect HHT with test cable to data link connector (X11/4), readout DTC fault codes.
2. Review 22,
3. Review 11, 21, 23, 24, 31, 33,
4. Perform Test and adjustment of engine, see DM, Engines, Vol. 1, section B, if necessary.
5. Ignition: **ON**

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC		Possible cause		Test step/Remedy [1]
		SAE nomenclature	Explanation	
–		No malfunction in system		In case of complaint, perform 23, 24, 25 or 26 in its entirety.
P0 100		MAF circuit malfunction	Hot film MAF sensor (B2/5) DTC description	23⇒ 4.0 11/27
P0 105	Only (USA), Vehicles with cylinder shut-off	MAP circuit malfunction	Pressure sensor (B28) DTC description	23⇒ 6.0 11/28
P0 110		IAT circuit malfunction	IAT sensor (in Hot film MAF sensor B2/5) DTC description	23⇒ 5.0 11/29
P0 115		ECT circuit malfunction	ECT sensor (B11/4) DTC description	23⇒ 8.0 11/30
P0 120		Throttle position circuit malfunction	Actual value potentiometer in EA/CC/ISC actuator (M16/6) DTC description	25⇒ 3.0 11/31
P0 130		O2S 1 circuit malfunction	A. O2S 1 (before TWC) (G3/4) B. O2S 1 (before TWC) (G3/4) voltage increase insufficient DTC description	23⇒ 11.0 11/32

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	Possible cause		Test step/Remedy [1]
	SAE nomenclature	Explanation	
P0 133	O2S 1 circuit slow response	A O2S 1 (before TWC) (G3/4), ageing correction value exceeded B O2S 1 (before TWC) (G3/4), ageing time period too long C O2S 1 (before TWC) (G3/4), ageing O2S 1 sensor response too slow DTC description	23⇒ 11.0 11/33
P0 135	O2S 1 heater circuit malfunction	O2S 1 heater (before TWC) (G3/4) DTC description	23 ⇒ 13.0 11/35
P0 136 Only USA	O2S 2 circuit malfunction	O2S 2 (after TWC) (G3/6) DTC description	23 ⇒ 15.0 11/32
P0 140	O2S 2 heater circuit malfunction	Right O2S 2 (before TWC) (G3/4) DTC description	23⇒ 11.0 11/32
P0 141 Only USA	O2S 2 heater circuit malfunction	Right O2S 2 heater (after TWC) (G3/6) DTC description	23⇒ 17.0 11/35
P0 150	O2S 1 circuit malfunction	A O2S 1 (before TWC) (G3/3) B O2S 1 (before TWC) (G3/3), voltage increase too slow DTC description	23⇒ 10.0 11/32

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	Possible cause		Test step/Remedy [1]
	SAE nomenclature	Explanation	
P0 153	O2S 1 circuit slow response	A O2S 1 (before TWC) (G3/3), ageing correction value exceeded B O2S 1 (before TWC) (G3/3), ageing time period too long C O2S 1 (before TWC) (G3/3), ageing O2S 1 sensor response too slow DTC description	23⇒ 10.0 11/33
P0 155	O2S 2 heater circuit malfunction	Left O2S 1 heater (before TWC) (G3/3) DTC description	23⇒ 12.0 11/35
P0 156 Only USA	O2S 2 circuit malfunction	Left O2S 2 (after TWC) (G3/5) DTC description	23⇒ 14.0 11/32
P0 160	O2S 2 heater circuit malfunction	Left O2S 2 (before TWC) (G3/5) DTC description	23⇒ 14.0 11/32
P0 161 Only USA	O2S 2 heater circuit malfunction	Right O2S 2 heater (after TWC) (G3/5) DTC description	23⇒ 16.0 11/35

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	Possible cause		Test step/Remedy [1]
	SAE nomenclature	Explanation	
P0 170	Fuel trim malfunction	A Self adaptation of fuel mixture “partial load“, right cylinder bank, at limit from engine control module (N3/10). B Self adaptation of fuel mixture “CTP“, right cylinder bank, at limit from engine control module (N3/10). DTC description	Intake air leak, injectors, diaphragm pressure regulator, engine wear. 11/36
P0 173	Fuel trim malfunction	A Self adaptation of fuel mixture “partial load“, left cylinder bank, at limit from engine control module (N3/10). B Self adaptation of fuel mixture “CTP“, left cylinder bank, at limit from engine control module (N3/10). DTC description	Intake air leak, injectors, diaphragm pressure regulator, engine wear. 11/36
P0 201	Injector circuit malfunction - cyl. 1	Injector (Y62y1) – cylinder 1 DTC description	23⇒ 18.0 11/37
P0 202	Injector circuit malfunction - cyl. 2	Injector (Y62y2) – cylinder 2 DTC description	23⇒ 19.0 11/37
P0 203	Injector circuit malfunction - cyl. 3	Injector (Y62y3) – cylinder 3 DTC description	23 ⇒ 20.0 11/37

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	Possible cause		Test step/Remedy [1]
	SAE nomenclature	Explanation	
P0 204	Injector circuit malfunction - cyl. 4	Injector (Y62y4) – cylinder 4 DTC description	23 ⇒ 21.0 11/37
P0 205	Injector circuit malfunction - cyl. 5	Injector (Y62y5) – cylinder 5 DTC description	23 ⇒ 22.0 11/37
P0 206	Injector circuit malfunction - cyl. 6	Injector (Y62y6) – cylinder 6 DTC description	23 ⇒ 23.0 11/37
P0 207	Injector circuit malfunction - cyl. 7	Injector (Y62y7) – cylinder 7 DTC description	23 ⇒ 24.0 11/37
P0 208	Injector circuit malfunction - cyl. 8	Injector (Y62y8) – cylinder 8 DTC description	23 ⇒ 25.0 11/37
P0 300	Random misfire detected	A Random misfire B Random misfire, TWC damaging DTC description	24 ⇒ 13.0 – 21.0 36 ⇒ 1.0 – 2.0 Compression pressure 11/39
P0 301	Cylinder 1 misfire detected	A Cylinder 1 misfire B Cylinder 1 misfire, TWC damaging DTC description	24 ⇒ 13.0 24 ⇒ 21.0 36 ⇒ 1.0 – 2.0 Compression pressure 11/39

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	Possible cause		Test step/Remedy [1]
	SAE nomenclature	Explanation	
P0 302	Cylinder 2 misfire detected	A Cylinder 2 misfire B Cylinder 2 misfire, TWC damaging DTC description	24 ⇒ 14.0 24 ⇒ 21.0 36 ⇒ 1.0 – 2.0 Compression pressure 11/39
P0 303	Cylinder 3 misfire detected	A Cylinder 3 misfire B Cylinder 3 misfire, TWC damaging DTC description	24 ⇒ 15.0 24 ⇒ 21.0 36 ⇒ 1.0 – 2.0 Compression pressure 11/39
P0 304	Cylinder 4 misfire detected	A Cylinder 4 misfire B Cylinder 4 misfire, TWC damaging DTC description	24 ⇒ 16.0 24 ⇒ 21.0 36 ⇒ 1.0 – 2.0 Compression pressure 11/39
P0 305	Cylinder 5 misfire detected	A Cylinder 5 misfire B Cylinder 5 misfire, TWC damaging DTC description	24 ⇒ 17.0 24 ⇒ 21.0 36 ⇒ 1.0 – 2.0 Compression pressure 11/39
P0 306	Cylinder 6 misfire detected	A Cylinder 6 misfire B Cylinder 6 misfire, TWC damaging DTC description	24 ⇒ 18.0 24 ⇒ 21.0 36 ⇒ 1.0 – 2.0 Compression pressure 11/39

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	Possible cause		Test step/Remedy [1]
	SAE nomenclature	Explanation	
P0 307	Cylinder 7 misfire detected	A Cylinder 7 misfire B Cylinder 7 misfire, TWC damaging DTC description	24 ⇒ 19.0 24 ⇒ 21.0 36 ⇒ 1.0 – 2.0 Compression pressure 11/39
P0 308	Cylinder 8 misfire detected	A Cylinder 8 misfire B Cylinder 8 misfire, TWC damaging DTC description	24 ⇒ 20.0 24 ⇒ 21.0 36 ⇒ 1.0 – 2.0 Compression pressure 11/39
P0 325	KS 1 circuit malfunction	Right KS 1 (A16g1) DTC description	Wiring, connector, A16g1 11/42
P0 330	KS 2 circuit malfunction	Left KS 2 (A16g2) DTC description	Wiring, connector, A16g2 11/42
P0 335	CKP sensor circuit malfunction	CKP sensor (L5) DTC description	24 ⇒ 11.0 11/42
P0 341	CMP sensor circuit range/performance	Camshaft Hall-effect sensor (B6/1) DTC description	24 ⇒ 12.0 11/43
P0 370	Angle deviation between camshaft and crankshaft	Angle deviation between camshaft and crankshaft.	Check basic adjustment of camshaft.

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC		Possible cause		Test step/Remedy [1]
		SAE nomenclature	Explanation	
P0 400		Exhaust gas recirculation flow malfunction	Exhaust gas recirculation malfunction (logic chain) DTC description	23 ⇒ 29.0 11/45
P0 410	Only USA	Air injection system malfunction	AIR system malfunction (logic chain) DTC description	23 ⇒ 26.0– 28.0 11/46
P0 422		TWC (right) efficiency below threshold	TWC efficiency below threshold DTC description	Replace right TWC 11/48
P0 432		TWC (left) efficiency below threshold	TWC efficiency below threshold DTC description	Replace left TWC 11/48
P0 440	Only USA	EVAP system malfunction	EVAP malfunction (logic chain) DTC description	23 ⇒ 32.0 – 33.0 11/50
P0 441	Only USA	EVAP system malfunction (leak) (logic chain)	Purge valve (Y58/1) (function) DTC description	23 ⇒ 31.0 – 32.0 11/50
P0 442	Only USA	EVAP system leak detected (small leak)	EVAP system, small leak DTC description	23 ⇒ 33.0 11/50
P0 443		EVAP system purge control valve circuit malfunction	Purge control valve (Y58/1) DTC description	23 ⇒ 31.0 11/54
P0 446	Only USA	EVAP system vent control malfunction	A. Activated charcoal canister shut-off valve (Y58/4) B. End stage activated charcoal canister shut-off valve (Y58/4) within N3/10 DTC description	23 ⇒ 34.0 – 35.0 N3/10 11/55

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	Possible cause		Test step/Remedy [1]
	SAE nomenclature	Explanation	
P0 450 Only USA	EVAP system pressure sensor malfunction	A. Fuel tank pressure sensor (B4/3) electrical fault B. Fuel tank pressure sensor (B4/3) electrical fluctuations DTC description	23 ⇒ 35.0 Charcoal canister plugged. 11/56
P0 455 Only USA	EVAP system leak detected (large leak)	EVAP system, large leak Fuel tank pressure sensor (B4/3) (voltage supply) DTC description	23 ⇒ 33.0 23 ⇒ 35.0 11/50
P0 460	Fuel level sensor circuit low input	Fuel tank level too low	Read out instrument cluster memory.
P0 500	VSS sensor malfunction	A VSS left front B VSS left rear DTC description	Test ASR, ESP see DM, Chassis and Drivetrain, Vol. 3, 10.2 11/57
P0 507	ISC rpm higher than expected	Idle control system, unplausible DTC description	25 ⇒ 1.0 – 3.0 11/58
P0 560	System voltage malfunction	Voltage supply to engine control module (N3/10) DTC description	23 ⇒ 1.0 – 2.0 11/59
P0 520 (not USA)	Cylinder shut-off, oil pressure sensor	Engine with cylinder shut-off only	
P0 560	Voltage supply to control module ME	Voltage supply	23 ⇒ 1.0 – 2.0 11/59
P0 565	Cruise control switch	CC switch (S40)	25 ⇒ 1.0

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	Possible cause		Test step/Remedy [1]
	SAE nomenclature	Explanation	
P0 600	Serial communication link malfunction	CAN bus from ESP/SPS control module (N47-5) DTC description	23 ⇒ 36.0 11/60
P0 604	Internal control module random Access memory (RAM) error	A Engine control module (N3/10) B Engine control module (N3/10)	(N3/10)
P0 605	Internal control module read only memory (ROM) error	Engine control module (N3/10)	(N3/10)
P0 700	Transmission control system malfunction Gear unplausi, transmission leak, Command sleeve stuck in pressure pos.	Read DTC memory of transmission control module. DTC description DTC description	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.3 11/61 11/62
P0 702	Transmission control system electrical Voltage supply to solenoid valves	Read DTC memory of transmission control module. DTC description	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.3 11/63
P0 715	Input/turbine speed sensor circuit malfunction RPM sensor voltage supply and function	Read DTC memory of transmission control module. DTC description	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.3, 23 11/65

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	Possible cause		Test step/Remedy [1]
	SAE nomenclature	Explanation	
P0 720	Output speed sensor circuit malfunction CAN fault recognition	Read DTC memory of transmission control module. DTC description	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.3, 23 11/67
P0 730	Incorrect gear ratio Ratio comparison negative (numerous)	Read DTC memory of transmission control module. DTC description	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.3, 23 11/68
P0 740	Torque converter clutch circuit malfunction	Read DTC memory of transmission control module. DTC description	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.3, 23 11/69
P0 743	Torque converter clutch circuit electrical	Read DTC memory of transmission control module. DTC description	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.3, 23 11/70
P0 748	Pressure control solenoid electrical Pressure control valve modulation press. Pressure control valve shift pressure	Read DTC memory of transmission control module. DTC description DTC description	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.3, 23 11/71 11/72
P0 753	Shift solenoid A electrical 1-2/4-5 solenoid shift valve	Read DTC memory of transmission control module. DTC description	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.3, 23 11/73
P0 758	Shift solenoid B electrical 2-3 solenoid shift valve	Read DTC memory of transmission control module. DTC description	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.3, 23 11/74

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	Possible cause		Test step/Remedy [1]
	SAE nomenclature	Explanation	
P0 763	Shift solenoid C electrical 3-4 solenoid shift valve	Read DTC memory of transmission control module. DTC description	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.3, 23 11/75
P0 801	Engine/climate control electric cooling fan malfunction	Engine/climate control electric cooling fan (M4/3).	23 ⇒ 38.0
P0 802	Resonance intake mainfold switchover valve malfunction	Resonance intake mainfold switchover valve (Y22/6).	23 ⇒ 30.0
P0 809	Angle deviation between camshaft and crankshaft	Angle deviation between camshaft and crankshaft.	Check basic adjustment of camshaft.
P0 811	CAN from electronic ignition lock	CAN from electronic ignition lock.	23 ⇒ 36.0
P1 031	O2 sensors (G3/3, G3/4) reversed	O2 sensors (G3/3, G3/4) reversed.	Check proper connection of O2 sensors in ETM.
P1 177	Oil sensor	Oil sensor (level, temperature, quality)(B40), Oil temperature implausible.	23 ⇒ 37.0
P1 178	Oil sensor	Oil sensor (level, temperature, quality)(B40), Oil level implausible.	23 ⇒ 37.0
P1 179	Oil sensor	Oil sensor (level, temperature, quality)(B40), Oil quality implausible.	23 ⇒ 37.0
P1 180	Oil sensor	Oil sensor (level, temperature, quality)(B40), Oil temperature too high.	23 ⇒ 37.0

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	Possible cause		Test step/Remedy [1]
	SAE nomenclature	Explanation	
P1 181	Engine/climate control electric cooling fan	Faulty	23 ⇒ 38.0
P1 183 (not USA)	Right hand cylinder bank shut-off (Y80)	Faulty	
P1 184 (not USA)	Left hand cylinder bank shut-off (Y81)	Faulty	
P1 185	Oil sensor	Oil sensor (level, temperature, quality)(B40), water in oil.	23 ⇒ 37.0
P1 186	Fuel safety shut-off recognized	EA/CC/ISC actuator (M16/6)	25 ⇒ 3.0 – 4.0, EA/CC/ISC actuator (M16/6) sticks or jammed, Check intake system for residue.
P1 225	Resonance intake mainfold switchover valve malfunction	Resonance intake mainfold switchover valve (Y22/6).	23 ⇒ 30.0
P1 233	EA/CC/ISC actuator (M16/6) icing problem	EA/CC/ISC actuator (M16/6) icing problem	Actuator
P1 355 (not USA)	Right hand cylinder bank shut-off (Y80)	Faulty	
P1 356 (not USA)	Left hand cylinder bank shut-off (Y81)	Faulty	
P1 357 (not USA)	Cylinder bank shut-off ON	Faulty	
P1 358 (not USA)	Cylinder bank shut-off OFF	Faulty	
P1 359 (not USA)	Cylinder bank shut-off OFF	Faulty	
P1 360 (not USA)	Cylinder bank shut-off OFF	Faulty	
P1 361 (not USA)	Cylinder bank shut-off OFF	Faulty	

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC		Possible cause		Test step/Remedy [1]
		SAE nomenclature	Explanation	
P1 366	(not USA)	Exhaust flap switchover valve	Faulty	
P1 380	(not USA)	Intake valve of cyl. does not with cylinder shut-off function	Faulty	
P1 386		Knock sensor control from ECM (N3/10) at end stop	Knock sensor regulation from engine control module (N3/10) at end stop, due to hardware problem. DTC description	1. Increased knock tendency due to bad fuel, carbon in combustion chamber or mechanical damage. 11/77
P1 400		EGR valve vacuum transducer	EGR valve vacuum transducer (Y31/1) faulty DTC description	23 ⇒ 29.0 11/78
P1 420	Only USA	AIR pump switchover valve	AIR pump switchover valve (Y32) DTC description	23 ⇒ 27.0 11/79
P1 453	Only USA	AIR relay module, AIR pump	Relay module, AIR pump (K40/4k3) in relay module (K40) DTC description	23 ⇒ 26.0 11/79
P1 491			Refrigerant pressure in A/C system too high	Check automatic A/C system.
P1 542		Pedal value sensor	Pedal value sensor (B37) DTC description	25 ⇒ 1.0 – 2.0 11/80

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	Possible cause		Test step/Remedy [1]
	SAE nomenclature	Explanation	
P1 570	CAN signal from DAS control module to engine control module	A. Start attempted with "locked" DAS B. CAN signal from DAS control module (N54/1) to engine control module (N3/10) interrupted. C. Engine control module (ME-SFI) and DAS control module are not compatible.	User error, Check correct operation of DAS, see DM, Body and Accessories, Vol. 1, 4.9, 4.10 23 ⇒ 36.0 Check control modules and part no.
P1 580	EA/CC/ISC actuator	EA/CC/ISC actuator (M16/1) DTC description	25 ⇒ 3.0 – 4.0 11/81
P1 584	Stop lamp switch	Stop lamp switch (S9/1)	Test ETS, ASR see DM, Chassis & Drivetrain, Vol. 3, 10.2
P1 603	CAN from EIS		23 ⇒ 36.0
P1 605		Poor road/traction condition recognition signal (via comparison of VSS rpm signals.	Test ASR/ESP see DM, Chassis and Drivetrain, Vol. 3, section 10.2

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	Possible cause		Test step/Remedy [1]
	SAE nomenclature	Explanation	
P1 642	Engine control module	Engine control module (N3/10) improperly version coded.	Check engine control module for correct version code.
P1 644		Transmission version can not be checked due to low voltage at transmission control module (N15/3).	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.3
P1 666 (not USA)	Cylinder shut-off does not open with cylinder shut-off ON function	Faulty	
P1 681	Crashsignal unplausible		23/40
P1 747	CAN signal from ETC	A. CAN failure: Transmission protection malfunction from transmission control module (N15/3) B. CAN failure: Instrument cluster DTC description	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.3 Test instrument cluster (A1), see DM, Body & Accessories, Vol. 1 11/60

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0100	Hot film MAF sensor (B2/5)
Fault memory and activation of Check Engine (MIL)	At end of test duration and fault, two in sequence driving-cycles with faults
Test frequency	Continuously
Tested signal or condition	Limit signals, MAF (B2/5)
Magnitude: lower limit Lower threshold limit Upper threshold limit Test duration	At idle approx. 6-48 kg/h (1.3-1.8 V) min. 25kg/h, if throttle plate angle is greater than 5° approx. 50-1200 kg/h, ECM map based on engine rpm and throttle plate angle. approx. 5 sec. per limit.
Test pre-requisites	No fault in throttle plate adjustment

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0105	Pressure sensor (B28)
Fault memory and activation of Check Engine (MIL)	At end of test duration and fault, two in sequence driving-cycles with faults
Test frequency	Continuously
Tested signal or condition	Limit values, Pressure sensor (B28)
Magnitude: lower limit Lower threshold limit Upper threshold limit Test duration	min -60 mbar, with engine rpm over 1300 rpm approx. 0 mbar, if throttle plate angle is greater than 80° approx. 500-1200 mbar, ECM map dependent on engoine rpm and throttle plate angle. approx. 5 sec. per limit.
Test pre-requisites	Lock time period of 30 seconds after start exceeded. No fault in the throttle plate angle.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0110	IAT sensor (in Hot film MAF sensor B2/5)
Fault memory and activation of Check Engine (MIL)	At end of test duration and fault, two in sequence driving-cycles with faults
Test frequency	Continuously
Tested signal or condition	Limit values, IAT sensor
Lower threshold limit Upper threshold limit Test duration	Fault if signal is smaller than 0.1 V (> 300k Ω ,approx. -50°C) Fault if signal is greater than 4.93 V (< 92 Ω , approx. +150°C) approx. 1 sec.
Hint	With faults, the reserve value of +20°C is used. Should the signal become plausible, the signal from the IAT is subsequently used again.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0115	ECT sensor (B11/4)
Fault memory and activation of Check Engine (MIL)	Two in sequence driving-cycles with faults
Test frequency, test duration	Continuously
Tested signal or condition	Limit values, ECT sensor (B11/4)
Lower threshold limit Upper threshold limit Plausibility	Fault, if the resistancve is: > 80 k Ω (approx. - 39°C) Fault if the resistance is: < 45 Ω (approx. +170°C) The temperature raise is compared to a stored baseline value. Independent of start temperature and engine rpm, a value of +15°C after 120-1200 sec. must be attained.
i	With faults, the reserve value from the temperature base value is used. Should the signal become plausible, the signal from the ECT sensor is subsequently used again.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0120	Actual values-potentiometer in EA/CC/ISC actuator (M16/1)
Fault memory and activation of Check Engine (MIL)	At end of test duration and fault, two in sequence driving-cycles with faults
Test frequency	Continuously
Tested signal or condition	Voltage supply, Actual values-potentiometer 1 or 2
Actual values potentiometer 1 Actual values potentiometer 2	Fault if: voltage is less than 0.275 V or is greater than 4.83 V Fault if: voltage is less than 0.176 V or is greater than 4.74 V

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0130	Right 02S 1 (before TWC)
DTC P0136	Right 02S 2 (after TWC) (only USA)
DTC P0140	Right 02S 1 (before TWC)
DTC P0150	Left 02S 2 (before TWC)
DTC P0156	Left 02S 2 (after TWC) (only USA)
DTC P0160	Left 02S 1 (before TWC)
Fault memory and activation of Check Engine (MIL)	At end of test duration and fault, two in sequence driving-cycles with faults
Test frequency	Continuously
Tested signal or condition	A. Limit values, 02 sensor signal B. Sensor status exchange
A. 02 sensor limit value signal Lower threshold limit value Upper threshold limit Test duration B. Sensor status exchange	 <-0.15V > 1.5 V approx. 5 sec. With 02 heater on (approx. 220sec.), the sensor signal does not remain in the voltage window (0.4-0.6V) for longer then 15 seconds.
Test pre-requisites	– engine rpm approx. 1000-2000 – engine load approx. 15-50% – catalytic converter temperature > 380°C – release Lambda regulation
i Also see: 11/78	Via testing, all electrical connection faults of the 02 sensors before and after the catalytic converters are recognized (harness open circuits and shorts/high ohmic valueshorts to ground or positive). • The 02 sensor signal wire has a high ohmic short circuit or limited voltage increase. • The 02 sensor signal wire has a open circuit. With a cold 02 sensor: a high ohmic short circuit to positive or a short to ground on control module ME (!) If the 02 sensor signal wire ground is shorted to positive, the control module ME will be destroyed.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0133 DTC P0153	Right 02S 1 (before TWC) Left 02S 2 (before TWC)
Fault memory and activation of Check Engine (MIL)	At end of test duration and fault, two in sequence driving-cycles with faults
Test frequency	Continuously
Tested signal or condition	A. Correction factor exceeded B. Time period too long
A. correction factor exceeded B. Time period too long Test duration	approx. ±1.2 sec. > 5 sec. (average value via 15 measurements) up to 190 sec.
Test pre-requisites	– engine rpm approx. 1000-2000 – engine load approx. 15-50% – catalytic converter temperature > 380°C – no faults with effective function of catalytic converter – no faults with 02 sensor heating

Continued

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0133 DTC P0153	Right 02S 1 (before TWC) Left 02S 2 (before TWC)
Test sequence	The engine control module determines the the mid value of Lambda. This value is compared to the stored value for optimal exhaust gas value. With numerous of excessive values, a correction value for the lambda regulation is determined. With the correction factor (value with a new 02 sensor approx 0) the aging of the 02 sensor before the catalytic converter is equalized within certain limits With exceeded values beyond the correction values, the 02 sensor before the catalytic converter must be replaced. Additionally, the timespan of the sensor before the catalytic converter is evaluated. If there is no 02 sensor condition interexchange, then the lambda regulation is not active and the two sensor regulation will not take place. With the 02 sensor signals after the catalytic converter, the effectiveness of the catalytic converter is monitored.
i Also see: 11/79	Time span for 02 sensor before catalytic converter too long: 02 sensor located after the catalytic converter is no longer monitored. Correction factor of the 02 sensor before the catalytic converter exceeded: the 02 sensor after the catalytic converter is to be further monitored. If a fault is for both the 02 sensor before and after the catalytic converter is recorded, then usually the 02 sensor behind the catalytic converter is faulty.

DTC P0135	Right 02S 1 (before TWC)
DTC P0141	Right 02S 2 (after TWC)
DTC P0155	Left 02S 1 (before TWC)
DTC P0161	Left 02S 2 (after TWC)
Fault memory and activation of Check Engine (MIL)	At end of test duration and fault, two in sequence driving-cycles with faults
Test frequency	Continuously
Tested signal or condition	Calculated resistance value of the 02 sensor heating
Lower threshold limit Upper threshold limit	< 2.0 Ω (approx. 6 A at 12 V) > 10 Ω (approx. 1.2 A at 12 V)
Test pre-requisites	Engine runs 02 sensor heating ON and a heating time of 220 sec. has elapsed.
i	A fault code for sensor heating is also set, if the time period for the sensor signal suddenly lengthens by over 25 seconds.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0170 DTC P0173	Right cylinder bank Left cylinder bank
Fault memory and activation of Check Engine (MIL)	At end of test duration and fault, activation of Check Engine (MIL), after two in sequence driving-cycles with faults
Test frequency	Continuously
Tested signal or condition	Limit values of self adaption of mixture formation
A. Limit threshold value for idle B. Limit threshold value for part load	approx. ± 1.0 ms (approx. 25% of injection time at idle) 0.7-1.3 factor
i	For the self adaption of the mixture formation to attain a new value, a drive time of approx. 30 minutes with lambda regulation is required. The coolant temperature at time of start must be < 60°C.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0201	Injector 1 (Y62y1)
DTC P0202	Injector 2 (Y62y2)
DTC P0203	Injector 3 (Y62y3)
DTC P0204	Injector 4 (Y62y4)
DTC P0205	Injector 5 (Y62y5)
DTC P0206	Injector 6 (Y62y6)
DTC P0207	Injector 7 (Y62y7)
DTC P0208	Injector 8 (Y62y8)
Fault memory and activation of Check Engine (MIL)	At end of test duration and fault, two in sequence driving-cycles with faults
Test frequency	Continuously
Test requirements: Battery voltage between 8 - 17 V	Voltage and amp supply to each indivdual injector
Limit threshold value: amps required Limit threshold value: voltage Wire has open circuit Test duration	> 4.2 A < 2.5 V no voltage at injector, approx. 4 - 8 volts at load free output of the engine control module ME approx. 5 sec.

Continued

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0201	Injector 1 (Y62y1)
DTC P0202	Injector 2 (Y62y2)
DTC P0203	Injector 3 (Y62y3)
DTC P0204	Injector 4 (Y62y4)
DTC P0205	Injector 5 (Y62y5)
DTC P0206	Injector 6 (Y62y6)
DTC P0207	Injector 7 (Y62y7)
DTC P0208	Injector 8 (Y62y8)
i	The activation of each indivdual injector is checked for harness opens and shorts to ground or positive. Shorts to ground and open circuits are recognized with a locked endstage, where else a short to positive is recognized with a conducting endstage. With a fault detected, the endstage is immediately no longer activated.
(!)	With a short to ground, the indivdual injector remains continuously open.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0300 DTC P0301 DTC P0302 DTC P0303 DTC P0304 DTC P0305 DTC P0306 DTC P0307 DTC P0308 DTC P0460 DTC P0462	Random misfire Misfire, cyl. 1 Misfire, cyl. 2 Misfire, cyl. 3 Misfire, cyl. 4 Misfire, cyl. 5 Misfire, cyl. 6 Misfire, cyl. 7 Misfire, cyl. 8 Fuel level in fuel tank too low Fuel level in fuel tank too low
Fault memory and activation of Check Engine (MIL)	At end of test duration and fault, activation of Check Engine (MIL), after two in sequence driving-cycles with faults A. Misfire (emissions limit) Activation of Check Engine (MIL), after two in sequence driving-cycles with faults B. TWC damaging Activation of Check Engine (MIL) (blinks), immediately
Test frequency	Continuously
Tested signal or condition	Count of recognized combustion misfires (recognition via uneven running engine evaluation)
Limit threshold values:	A. max. 20 combustion misfires within 1000 engine revolutions B. max. 4-35 combustion misfires within 200 engine revolutions (ECM map dependent of engine rpm and load i.e. 4 misfires at medium engine rpm and load, 35 misfires at idle w/o load)

Continued

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0300	Random misfire
DTC P0301	Misfire, cyl. 1
DTC P0302	Misfire, cyl. 2
DTC P0303	Misfire, cyl. 3
DTC P0304	Misfire, cyl. 4
DTC P0305	Misfire, cyl. 5
DTC P0306	Misfire, cyl. 6
DTC P0307	Misfire, cyl. 7
DTC P0308	Misfire, cyl. 8
DTC P0460	Fuel level in fuel tank too low
DTC P0462	Fuel level in fuel tank too low
Test pre-requisites	– engine rpm approx. 450-6000 rpm – engine rpm variation less than 1900/rpm per sec. – engine load variation < 50% per second – engine start undertaken less then 5 seconds ago – no ESP interaction – CKP sensor adaption in coast range has been accomplished – No uneven terrain recognized (via CAN from ASR/ESP control module, attained via comparison of VSS signals) – no faults from camshaft Hall-effect sensor (B6/1) – no injector shutoff

Continued

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0300	Random misfire
DTC P0301	Misfire, cyl. 1
DTC P0302	Misfire, cyl. 2
DTC P0303	Misfire, cyl. 3
DTC P0304	Misfire, cyl. 4
DTC P0305	Misfire, cyl. 5
DTC P0306	Misfire, cyl. 6
DTC P0307	Misfire, cyl. 7
DTC P0308	Misfire, cyl. 8
DTC P0460	Fuel level in fuel tank too low
DTC P0462	Fuel level in fuel tank too low
i	If too many misfires occurr in one cylinder, then that cylinder will be turned off (cylinder selective fuel shut-off). **Misfire due to ignition system faults:** If ignition does not occur, misfires will result. If there are faults stored in the ignition system, in addition to the misfire, start at the ignition system first. Max. rough running per cylinder is $3m^2$ if this value is exceeded, then proceeed as follows: 1. turn off one of the ignition circuits, using the SDS/HHT 2. Observe rough running of the affected cylinder: if the value has changed very little, (up to approx. $2m^2$, then the remaining ignition circuit is OK. If the value has changed considerably, (beyond $2m^2$ then the activated ignition circuit has a fault: spark plug, igntion lead or igntion coil. **Misfire due to fuel starvation:** With recognized misfires, with a low fuel level in the fuel tank the DTC codes P0460 and P0462 are set, thus this information indicates a misfire due to low fuel level in fuel tank. **Misfire due to additional causes:** Misfires can be caused by the fuel injection system, additional faults may be stored, mechanical faults of the engine must be considered as well.

Continued

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0325 DTC P0330	Right KS (A16g1) Left KS (A16g2)
Fault memory and activation of Check Engine (MIL)	Fault is immediately stored in memory Check Engine (MIL) is not activated
Test frequency	Continuously
Tested signal or condition	Knock sensor signal (in control module determined comparison via amplitude)
Lower threshold limit Upper threshold limit	approx. 0.10V approx. 4.98V
Test pre-requisites	– engine at operating temperature – engine rpm > 2000/rpm – engine load > 40% – knock regulation not active
i	With faults, a safety ignition timing retart setting on all cylinders.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0335	CKP sensor signal (L5)
Fault memory and activation of Check Engine (MIL)	At end of test duration and fault, two in sequence driving-cycles with faults
Test frequency	Continuously
Tested signal or condition	CKP sensor (L5) signal (flywheel tooth count)
Lower threshold limit Upper threshold limit Test duration	(60 -2 teeth) - 1 tooth 60 -2 teeth) + 1 tooth aprox. 5 sec.

DTC P0341	CMP sensor signal (B6/1)
Fault memory and activation of Check Engine (MIL)	At end of test duration and fault, two in sequence driving-cycles with faults
Test frequency	Continuously
Tested signal or condition	CMP sensor (B6/1)
Plausibility No signal: Count:	 within 2 engine revolutions the signal must change from 0 to 1 and from 1 to 0 max. of 1 signal changeover (1 to 0 and 0 to 1) per engine revolution

Continued..

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0341	CMP sensor signal (B6/1)
Test pre-requisites	– engine rpm 25-6000 – no faults from CKP sensor (L5)
i	To minimize damage to the catalytic converter, a missing signal from the Hall sensor or improper synchronization, results in fuel shutoff.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0400	EGR valve vacuum transducer (Y31/1)
Fault memory and activation of Check Engine (MIL)	At end of test duration and fault, two in sequence driving-cycles with faults
Test frequency	One per drive
Tested signal or condition	Intake manifold pressure
Limit threshold value Test duration	Vacuum in manifold must decrease by 38 mbar when exhaust gas recirculation flow is active approx. 2 sec.
Test pre-requisites	– no fault from EGR valve vacuum transducer (Y31/1) – no fault from pressure sensor (B28) – injector shut off is active – engine rpm approx. 900-1700 and constant – vehicle altitude location is under 8000 ft
i	If the requirement are met, then the intake manifold pressure is measured and subsequently the exhaust gas recirculation is briefly activated.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0410	Air injection system
Fault memory and activation of Check Engine (MIL)	At end of test duration and fault, two in sequence driving-cycles with faults
Test frequency	Once per driving cycle.
Tested signal or condition	Lambda regulation
Limit threshold value Test duration	Lambda regulation factor approx. +25% ("rich" - detent stop) approx. 10 sec.
Test pre-requisites	– engine at idle – vehicle stationary – air injection pump has been activated 1x after engine start – no faults with voltage supply to exhaust gas recirculation valve (Y31/1), air pump switchover valve (Y32) and electrical air pump (M33) – no faults with exhaust gas recirculation system – no faults with EA/CC/ISC actuator (M16/1) – no combustion misfires – no faults with 02 sensor before catalytic converter, aging – no faults with CAN Databus – self adaption of mixture formation not at limit values – outside air pressure over approx. 780 hPa (since the test will not be done above 8000 ft) – engine coolant temperature greater than 50°C – Lambda regulation released – A/C system OFF

Continued..

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0410	Air injection system
Test sequence	With the start of the logic chain, all functions for the self adaption of the mixture formation are locked. The exhaust gas recirculation valves are closed and the current lambda regulation factor is attained. There after air injection follows. The mixture must be leaned out. As a result, the lambda regulation factor reacts with an increase of approx. 25%.
i	If the requirements change during the test, the test is as a result stopped and is later restarted again.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0422 DTC P0432	TWC right efficiency TWC left efficiency
Fault memory and activation of Check Engine (MIL)	At end of test duration and fault, two in sequence driving-cycles with faults
Test frequency	Continuously
Tested signal or condition	Voltage relationship (amplitudes) between 02 sensors before catalytic converters and 02 sensors after catalytic converters
Limit threshold value Test duration	02 sensor signal after catalytic converter is max. 80% of 02 sensor signal before catalytic converter approx. 170 sec.
Test pre-requisites	– engine rpm 1050-2400 – engine load approx. 20% to 54% – catalytic converter temperature > 380˚C – lambda regulation released and lambda > 0.4 – no faults with 02 sensors (signal, heating, aging) – no combustion misfires

Continued

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0422 DTC P0432	TWC right efficiency (continued) TWC left efficiency
i	The catalytic converter is evaluated for its oxygen storing capability. Within the required engine rpm and load ranges many measurements need to be accomplished. The results are compared to a map and from there faults are recognized. The amplitude of the 02 sensors after the catalytic converters must be smaller then the amplitude of the 02 sensors before the catalytic converters. (Hint; if for example, a monolith was left out within the catalytic converter, then the 02 sensors signals both before and after the catalytic converters would be identical). If the fault codes for the catalytic converter and the 02 sensor before stored at the same time, then replace the 02 sensor before the catalytic converter first. If thereafter, no more catalytic converter fault is present, then the catalytic converter is slightly reducted in effectiveness, but does not need to be replaced.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0440	Evap. system malfunction
DTC P0441	Evap. system malfunction (purge valve function)
DTC P0442	Evap. system leak small
DTC P0455	Evap. system leak large
Fault memory Activation of Check Engine (MIL)	After completion of test duration and faults Two in sequence driving-cycles with faults
Test frequency	Once per drive-cycle
Tested signal or condition	Pressure values per fuel tank pressure sensor (B4/3)
Large leak test Small leak test Test duration	Vacuum of approx. 0.4 mbar per second is not attained. Loss of vacuum within closed system is 15% greater the achieved vacuum values during the large leak test above. approx. 30 sec

Continued

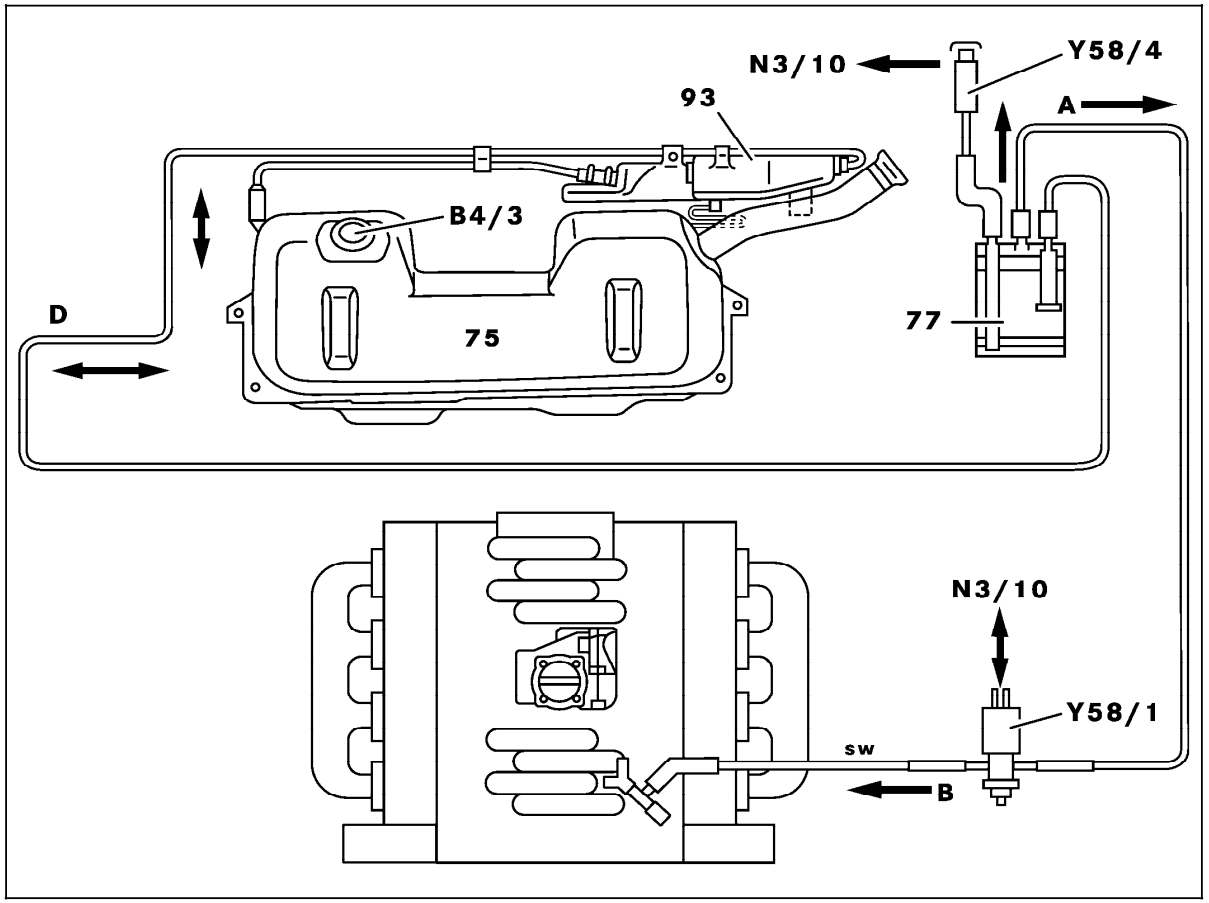
Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0440	Evap. system malfunction
DTC P0441	Evap. system malfunction, purge valve function
DTC P0442	Evap. system leak small
DTC P0455	Evap. system leak large
Test pre-requisites	– engine at idle – vehicle stationary – lock time of approx. 16 min. after engine start has elapsed – lambda regulation released – air injection is not active – outside air pressure over approx. 780 hPa (since the test will not be done above 8000 ft) – little saturation of activated charcoal cannister – lambda is > 0.9 during the testing – with a fuel tank level of <1/4 and > 3/4 only the large leak test is undertaken – if the fuel within the fuel tank sloshes greatly (large pressure variations), the fuel tank pressure sensor (B4/3) recognizes same and stops the test. – no fault at activated charcoal cannistershut-off valve (Y58/4) – no fault at fuel tank pressure sensor (B4/3) – no fault at fuel level sensor – no fault purge valve function (open/close)
i	The DTC P0455 is stored in memory, if the fuel tank pressure sensor (B4/3) is defective.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

Evaporative System
Engine 119 shown without On-board Refueling Vapor Recovery

The leak test for the EVAP system must detect leaks of 1mm in diameter. By law no fuel vapors are to be admitted to atmosphere.



P47.30-0284-06

Figure 1

75	Fuel tank
77	Actvated charcoal cannister
93	Fuel tank expansion reservoir
A	Activated charcoal cannister to purge valve hose
B	Purge valve to intake manifold hose
D	Fuel tank to activated charcoal cannister hose
B4/3	Fuel tank pressure sensor
N3/10	Engine control module (ME-SFI)
Y58/1	Purge control vlave
Y58/4	Activated charcoal canister shut-off valve

Function

The leak test (logic chain) is acomplished in two phases:

- Large leak test
- Small leak test

Continued...

Diagnosis – Diagnostic Trouble Code (DTC) Memory

Function (continued)

1. Large leak test

The activated charcoal cannister shut-off valve (Y58/4) is closed and the purge valve (Y58/1) is opened. As a result, the intake manifold vacuum reaches the fuel tank and is evaluated by the fuel tank pressure sensor (B4/3).
If no vacuum is established (i.e. approx. -4mbar within 10 seconds) a large leak is present (fuel tank cap open, loose hose connection etc.).

If the enginbe control module (N3/10) recognizes a large leak within the fuel system, the fuel reserve indicator lamp (A1e4) in the instrument cluster will blink as a result.

2. Small leak test

If the large leak test results in no fault then a small leak test is performed.
Once a vacuum of -7mbar is achieved, the purge control valve (Y58/1) is closed and the vacuum is evaluated for an additiuonal 30 seconds.
The vaccum must remain consistant during this time period. Should a leak be detected, then a fault is recognized.
After the test, the activated charcoal cannister shut-off valve (Y58/4) is opened.
The purge control valve (Y58/1) is checked for proper function via activation at the same time.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0443	Purge control valve (Y58/1)
Fault memory and activation of Check Engine (MIL)	At end of test duration and fault, two in sequence driving-cycles with faults
Test frequency	Continuously
Tested signal or condition	Voltage or amps at purge control valve
Limit threshold values Short to ground Short to positive (+ 12 V) Open circuit Test duration	 Voltage < 4 V Amps > 4.2 A No voltage at purge control valve (approx. 4-8 V at output stage). approx. 1 second
i	The activation of the purge control valve is checked for harness opens and shorts to ground or positive. Shorts to ground and open circuits are recognized with a locked endstage, where else a short to positive is recognized with a conducting endstage. With a fault detected, the endstage is immediately no longer activated.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0446	Activated charcoal cannister shut-off valve (Y58/4)
Fault memory and activation of Check Engine (MIL)	At end of test duration and fault, two in sequence driving-cycles with faults
Test frequency	Continuously
Tested signal or condition	Voltage supply at activated charcoal cannister shut-off valve (Y58/4)
Limit threshold values, voltage supply Short to ground Short to positive (+ 12 V) Open circuit Test duration	 Voltage < 4 V Amps > 4.2 A No voltage at purge control valve (approx. 4-8 V at output stage). approx. 1 second
i	The activation of the purge control valve is checked for harness opens and shorts to ground or positive. Shorts to ground and open circuits are recognized with a locked endstage, where else a short to positive is recognized with a conducting endstage. With a fault detected, the endstage is immediately no longer activated.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0450	Fuel tank pressure sensor (B4/3)
Fault memory and activation of Check Engine (MIL)	At end of test duration and fault, two in sequence driving-cycles with faults
Test frequency	Continual
Tested signal or condition	Fuel tank pressure sensor (B4/3) electrical fault Fuel tank pressure sensor (B4/3) signal flucuations
A Lower threshold limit Upper threshold limit Test duration **B** Signal sequence	 greater than 4.7 V (relates to approx. 35 mbar positive pressure) smaller than 0.1 V (relates to approx. -60 mbar vacuum) approx. 10 sec. The fuel tank pressure, with active recirculation can pusate at max. 2 mbar (0.1 V), otherwise the activated charcoal cannister maybe clogged.
Test pre-requisites	– engine at idle
i	The test is run independent of the evap. system leak test The sensor is tested for an electrical fault (short circuit, short to ground or positive). If the sensor voltage is below or above values, a fault is present. Base line for fuel tank pressure sensor: -50 mbar approx. 0.5 V; 0 mbar approx. 3.0 V; +30 mbar approx. 4.5 V. If the sensor is "hung",a constant signal yet plausible signal can be present. In this case, a large leak will be present in the evap. system.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0500	VSS signal
Fault memory and activation of Check Engine (MIL)	At end of test duration and fault, two in sequence driving-cycles with faults, stored in DTC memory Check Engine (MIL) is not activated (illuminated)
Test frequency	Continuously
Tested signal or condition	A VSS signal left front B VSS signal left rear
Limit threshold values Test duration Plausibility Test duration	After approx. 8 miles per hr vehicle speed, the VSS signals must be recognized approx. 5 sec. Requirement after approx. 25 miles per hr vehicle speed: VSS front minus VSS rear < ± 18 miles per hr approx. 30 sec.
Test pre-requisites	– engine rpm approx. 2500-4500 – engine load > 40% – transmission selector lever in D
i	The wheel speed (VSS signal) is recognized and evaluated via the ASR or ESP (G-wagen = ABS) control module. The ME-SFI control module receives the VSS signal via the CAN databus. Readout DTC memory (i.e. driving on dynometer) for ME-SFI and ASR or ME-SFI and ESP control modules [G-wagen = fault codes in ME and ABS control modules]).

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0507	ISC control system unplausible
Fault memory and activation of Check Engine (MIL)	At end of test duration and fault, two in sequence driving-cycles with faults
Test frequency	Continuously
Tested signal or condition	Engine rpm
Upper threshold limit value Lower threshold limit test duration	Nominal value + 200 rpm Nominal value - 100 rpm approx. 30 sec. If the activation of the actuator motor within actuator (via the ME control module) is performed, then the new value must be attained within 25 sec.
Test pre-requisites	– Engine temperature > 20° C – Climate control system: **OFF** – Vehicle stationary

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0520 (not USA)	Cylinder shut-off, oil pressure sensor
Fault memory and activation of Check Engine (MIL)	–
Test frequency	–
Tested signal or condition	–
Limit threshold value Test duration	–
Test pre-requisites	–

DTC P0560	Battery voltage at ME-SFI control module
Fault memory and activation of Check Engine (MIL)	Two in sequence driving-cycles with faults
Test frequency	Continuously
Tested signal or condition	Battery voltage to control module ME
Limit threshold value Test duration	Voltage must be between approx. 8 V and 17.5 V approx. 5 sec.
Test pre-requisites	– Time period of 180 sec. has elapsed since start

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0600 DTC P1747	CAN bus from ASR/ESP control module CAN bus from ETC or instrument cluster
Fault memory and activation of Check Engine (MIL)	At end of test duration and fault, two in sequence driving-cycles with faults
Test frequency	Continuously
Tested signal or condition	CAN communication
Test duration	approx. 15 sec.
i	The data transmission between the control modules is monitored via the CAN controller within the ME-SFI control module.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0700	Transmission control system malf. (gear ratio unplausible, transmission leak)
Fault memory and activation of Check Engine (MIL)	At end of test duration and fault, two in sequence driving-cycles with faults
Monitor time and test frequency	Continuously
Tested signal or condition	Calculated gear ratios relationship out of tolerance
Acceptable gear ratios Test duration	–0.20 to 0.20 1st and 2nd gear –0.05 to 0.050 3rd gear –0.03 to 0.030 4th and 5th gear –0.02 to 0.20 Reverse gear approx. 2 sec.
Test pre-requisites	– engine rpm greater than 400 – output shaft rpm greater than 180 rpm (12 miles per hr) – no shift undertaken
Test sequence	If there is no shift undertaken, then the ETC control module recognizes the gear ratio relationship for the gear in use. If the acceptable gear ratio is out of tolerance or the gear recognition is unplausible, then the modulator pressure is adjusted to its highest value after approx. 5 seconds. Should the gear ratio remain out of tolerance or the gear recognition is unplausible then after 1 second a DTC is stored.
i	The calculated gear ratios are calculated from the following values: N2 rpm, N3 rpm and outputshaft rpm (via rear wheel VSS). Faults are noted by the ETC control module and sent via CAN data bus to the ME-SFI control module. DTC storage and activation of the CHECK ENGINE (MIL) occur via the ME-SFI control module. Readout additional DTC 51 from ETC control module.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0700	Command valve sticks in pressure position
Fault memory and activation of Check Engine (MIL)	At end of test duration and fault, two in sequence driving-cycles with faults
Test frequency	Continuously
Tested signal or condition	Calculated gear ratio relationship out of tolerance
Acceptable gear ratios Test duration	–0.20 to 0.20 1st and 2nd gear –0.05 to 0.050 3rd gear –0.03 to 0.030 4th and 5th gear –0.02 to 0.20 Reverse gear approx. 2 sec.
Test pre-requisites	– engine rpm greater than 400 – output shaft rpm greater than 180 rpm (12 miles per hr) – no shift undertaken
Test sequence	After each shift procedure the shift pressure is reduced gradually. If the activated shift components drag after the pressure reduction, the command valve will bind in the shift phase (pressure) side. Shift components which drag will be recognized via the gear ratio relationship tolerances
i	The calculated gear ratios are calculated from the following values: N2 rpm, N3 rpm and outputshaft rpm (via rear wheel VSS). Faults are noted by the ETC control module and sent via CAN data bus to the ME-SFI control module. DTC storage and activation of the CHECK ENGINE (MIL) occur via the ME-SFI control module. Readout additional DTC 51, 52 from ETC control module.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0702	Transmission control system malf. (electrical)
Fault memory and activation of Check Engine (MIL)	At end of test duration and fault, two in sequence driving-cycles with faults
Test frequency	Continuously
Tested signal or condition	Faults within ETC control module – CAN data bus communication – Unacceptable version coding – Internal memory (RAM, ROM, EEPROM)
i	Faults are recognized via the ETC control module and are sent via the CAN data bus to the ME-SFI control module. DTC memory and activation of the CHECK ENGINE MIL are done via the ME-SFI control module. Readout additional DTCs 56–65 in ETC control module.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0702	Voltage supply to solenoid valves
Fault memory and activation of Check Engine (MIL)	At end of test duration and fault, two in sequence driving-cycles with faults
Test frequency	Continuously
Tested signal or condition	Voltage supply to solenoid valves
Lower threshold limit value Upper threshold limit value	approx. 8.5 V (longer then approx. 0.1 sec.) approx. 15 V (longer then approx. 0.1 sec.)
Test sequence	The solenoid valves are supplied battery voltage vis the ETC control module. The difference in value between battery voltage and supplied battery voltage to the solenoid valves is monitored by the ETC control module.
i	Faults are recognized via the ETC control module and are sent via the CAN data bus to the ME-SFI control module. DTC memory and activation of the CHECK ENGINE MIL are done via the ME-SFI control module. Readout additional DTC in ETC control module.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0715	RPM sensor function, voltage supply
Fault memory and activation of Check Engine (MIL)	At end of test duration and fault, two in sequence driving-cycles with faults
Test frequency	Continuously
Tested signal or condition	– RPM sensor voltage supply – N2 rpm – N3 rpm
RPM sensor voltage supply Lower threshold limit value Upper threshold limit value N2, N3 rpm signals Test duration	 < 4.8 V > 7.2 V Signals recognized and plausible approx. 1 sec.
Test pre-requisites N2 rpm sensor	– engine rpm > 450 – right rear wheel rpm (VSS) > 250 – left rear wheel rpm (VSS) > 250 – 3rd or 4th gear recognized – output shaft rpm > 180 rpm (12 miles per hr) – no shift undertaken

Continued

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0715	RPM sensor function, voltage supply
Test sequence	After a predetermined engine and wheel rpm, the rpm sensor signals must be recognized. For the N3 rpm signal, 3rd or 4th gear must be engaged.
i	Faults are recognized via the ETC control module and are sent via the CAN data bus to the ME-SFI control module. DTC memory and activation of the CHECK ENGINE MIL are done via the ME-SFI control module. Readout additional DTC i1, i2, i3 in ETC control module.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0720	CAN fault recognition
Fault memory and activation of Check Engine (MIL)	At end of test duration and fault, two in sequence driving-cycles with faults
Test frequency	Continuously
Tested signal or condition	Wheel rpm (VSS) is checked for plausibility via ETC control module which receives the signal via the ASR and ESP control modules via the CAN data bus
Test duration	approx. 1 sec.
i	Faults are recognized via the ETC control module and are sent via the CAN data bus to the ME-SFI control module. DTC memory and activation of the CHECK ENGINE MIL are done via the ME-SFI control module. Readout additional DTC (22, 23, 38) in ETC control module.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0730	Transmission range comparison
Fault memory and activation of Check Engine (MIL)	At end of test duration and fault, two in sequence driving-cycles with faults
Test frequency	Continuously
Tested signal or condition	Comparison of known gear ratio and engaged gear (calculated gear ratio) is at least 6X negative
Test pre-requisites	– 2nd, 3rd, 4th or 5th gear recognized – engine rpm greater than 450 – output shaft rpm greater than 180 rpm (12 miles per hr) – no shift undertaken
i	The calculated gear ratios are calculated from the following values: N2 rpm, N3 rpm and outputshaft rpm (via rear wheel VSS). Faults are noted by the ETC control module and sent via CAN data bus to the ME-SFI control module. DTC storage and activation of the CHECK ENGINE (MIL) occur via the ME-SFI control module. Readout additional DTC (55) from ETC control module.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0740	Torque converter lock-up clutch
Fault memory and activation of Check Engine (MIL)	At end of test duration and fault, two in sequence driving-cycles with faults
Test frequency	Continuously
Tested signal or condition	Friction value of torque converter lock-up clutch
Test sequence	The friction value is monitored via during torque converter lock-up by noting rpm differences. Should the values be out of tolerance numerous times, a DTC fault is noted.
i	Faults are recognized via the ETC control module and are sent via the CAN data bus to the ME-SFI control module. DTC memory and activation of the CHECK ENGINE MIL are done via the ME-SFI control module. Readout additional DTC 53 in ETC control module.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0743	PWM solenoid valve (Y3/6y6)
Fault memory and activation of Check Engine (MIL)	At end of test duration and fault, two in sequence driving-cycles with faults
Test frequency	Continuously
Tested signal or condition	PWM solenoid valve engagement quality
Lower threshold limit value Upper threshold limit value Test duration	< 5 % > 94% 1 sec.
i	Faults are recognized via the ETC control module and are sent via the CAN data bus to the ME-SFI control module. DTC memory and activation of the CHECK ENGINE MIL are done via the ME-SFI control module. Readout additional DTC 5 in ETC control module.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0748	Modulating pressure regulating solenoid valve (Y3/6y1)
Fault memory and activation of Check Engine (MIL)	At end of test duration and fault, two in sequence driving-cycles with faults
Monitor time and test frequency	Continuously
Tested signal or condition	Activation of modulating pressure regulating solenoid valve
Limit values Short to ground Lower threshold limit value, voltage Upper threshold limit value, voltage Lower threshold limit value, amps Upper threshold limit value, amps Test duration	 < 0.4 V approx. 8.5 V approx. 15 V approx. 0.300 A approx. 0.700 A 1 sec.
i	Faults (open circuit, short or short within solenoid while activating) are recognized via the ETC control module and are sent via the CAN data bus to the ME-SFI control module. DTC memory and activation of the CHECK ENGINE MIL are done via the ME-SFI control module. Readout additional DTC Б in ETC control module.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0748	Shift pressure regulating solenoid valve (Y3/6y2)
Fault memory and activation of Check Engine (MIL)	At end of test duration and fault, two in sequence driving-cycles with faults
Test frequency	Continuously
Tested signal or condition	Activation of shift pressure regulating solenoid valve (Y3/6y2)
Limit values Short to ground Lower threshold limit value, voltage Upper threshold limit value, voltage Lower threshold limit value, amps Upper threshold limit value, amps Test duration	 < 0.4 V approx. 8.5 V approx. 15 V approx. 0.300 A approx. 0.700 A 1 sec.
i	Faults (open circuit, short or short within solenoid while activating) are recognized via the ETC control module and are sent via the CAN data bus to the ME-SFI control module. DTC memory and activation of the CHECK ENGINE MIL are done via the ME-SFI control module. Readout additional DTC 1 in ETC control module.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0753	1-2/4-5shift solenoid valve (Y3/6y3)
Fault memory and activation of Check Engine (MIL)	At end of test duration and fault, two in sequence driving-cycles with faults
Test frequency	Continuously
Tested signal or condition	Voltage supply to 1-2/4-5shift solenoid valve (Y3/6y3)
Limit values Lower threshold limit value, voltage Upper threshold limit value, voltage Test duration	 approx. 8.5 V approx. 15 V approx. 1 sec.
i	Faults (open circuit, short or short within solenoid while activating) are recognized via the ETC control module and are sent via the CAN data bus to the ME-SFI control module. DTC memory and activation of the CHECK ENGINE MIL are done via the ME-SFI control module. Readout additional DTC 2 in ETC control module.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0758	2-3 shift solenoid valve (Y3/6y5)
Fault memory and activation of Check Engine (MIL)	At end of test duration and fault, two in sequence driving-cycles with faults
Test frequency	Continuously
Tested signal or condition	Voltage supply to 2-3 shift solenoid valve (Y3/6y5)
Limit values Lower threshold limit value, voltage Upper threshold limit value, voltage Test duration	 approx. 8.5 V approx. 15 V approx. 1 sec.
i	Faults (open circuit, short or short within solenoid while activating) are recognized via the ETC control module and are sent via the CAN data bus to the ME-SFI control module. DTC memory and activation of the CHECK ENGINE MIL are done via the ME-SFI control module. Readout additional DTC ∃ in ETC control module.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P0763	3-4 shift solenoid valve (Y6/3y4)
Fault memory and activation of Check Engine (MIL)	At end of test duration and fault, two in sequence driving-cycles with faults
Test frequency	Continuously
Tested signal or condition	Voltage supply to 3-4 shift solenoid valve (Y6/3y4)
Limit values Lower threshold limit value, voltage Upper threshold limit value, voltage Test duration	 approx. 8.5 V approx. 15 V approx. 1 sec.
i	Faults (open circuit, short or short within solenoid while activating) are recognized via the ETC control module and are sent via the CAN data bus to the ME-SFI control module. DTC memory and activation of the CHECK ENGINE MIL are done via the ME-SFI control module. Readout additional DTC 4 in ETC control module.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P1183 (not USA)	Cylinder shut-off
DTC P1183 (not USA)	Cylinder shut-off
DTC P1355 (not USA)	Cylinder shut-off
DTC P1356 (not USA)	Cylinder shut-off
DTC P1357 (not USA)	Cylinder shut-off
DTC P1358 (not USA)	Cylinder shut-off
DTC P1359 (not USA)	Cylinder shut-off
DTC P1360 (not USA)	Cylinder shut-off
DTC P1361 (not USA)	Cylinder shut-off
DTC P1366 (not USA)	Cylinder shut-off
DTC P1380 (not USA)	Cylinder shut-off
Fault memory and activation of Check Engine (MIL)	–
Test frequency	–
Tested signal or condition	–
Limit threshold value Test duration	–
Test pre-requisites	–

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P1386	Knock sensor control in N3/10
Fault memory and activation of Check Engine (MIL)	At end of test duration and fault, fault is stored immediately Check Engine (MIL) is not activated (illuminated)
Test frequency	After each deactivation of the knock sensor control
Tested signal or condition	Hardware test of knock sensor control
Test pre-requisites	– engine at operating temperature – engine load is decreasing (deactivate knock sensor control)
i	Fault must appear at least 10 times.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	P1400 EGR valve vacuum transducer (Y31/1)
DTC P1400	EGR valve vacuum transducer (Y31/1)
Fault memory and activation of Check Engine (MIL)	At end of test duration and fault, two in sequence driving-cycles with faults
Test frequency	Continuously
Tested signal or condition	Voltage/amps check at EGR valve vacuum transducer (Y31/1)
Limit threshold values Short to ground Short to positive Open circuit	 approx. < 2.5 Volts approx. > 4.2 Amps no voltage at EGR valve vacuum transducer (Y31/1), (approx. 4-8 V at output side of control module ME).
Test pre-requisites	– Battery voltage at 8-17.1 Volts
i	Tested are shorts and open circuits (shorts to ground and to positive). Shorts to ground and open circuits are recognized with a locked endstage, where else a short to positive is recognized with a conducting endstage. With a fault the endstage is no longer activated.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P1420 DTC P1453	AIR pump switchover valve (Y32) AIR relay module, AIR pump
Fault memory and activation of Check Engine (MIL)	At end of test duration and fault, two in sequence driving-cycles with faults
Test frequency	Continuously
Tested signal or condition	Via the amp measurement of each endstage, the voltage supply of the relay air pump in relay module (K40) and AIR pump switchover valve (Y32) are evaluated.
Limit threshold values	Air injection: **OFF**: max. of 3 volts are allowed at the output side. Air injection: **ON**: a min. of 9 volts must be at the output side.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P1542	Pedal value sensor (B37)
Fault memory and activation of Check Engine (MIL)	faults are stored immediately, the Check Engine (MIL) is not activated.
Test frequency	Continuously
Tested signal or condition	Voltage signal 1 and 2 are compared
Difference at idle Difference at full load Plausibility Test duration	Fault, if the voltage difference is > 8 % (up to a 60% angle change of the pedal value sensor). Fault, if the voltage difference is > 25 % (beyond the 60% angle change of the pedal value sensor). For Comparison: signal 2 is multiplied 2X approx. 30 sec.
Test pre-requisites	– the lock time after start of 60 seconds has elapsed.
i	With the production start up of engine 112 and 113, a pedal sensor with Hall sensors has been phased in. Comparison of throttle plate angle to air mass value and pedal value sensor must be plausible.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P1580	EA/CC/ISC actuator (M16/1)
Fault memory and activation of Check Engine (MIL)	At end of test duration and fault, two in sequence driving-cycles with faults
Test frequency	Continuously
Tested signal or condition	Voltage comparison of actual values potentiometer 1 and actual values potentiometer 2
Plausibility	– Voltage difference can be up to 1° of the throttle plate angle. – Comparison of throttle plate angle to air mass value and pedal value sensor must be plausible.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC P1666 (not USA)	Cylinder shut-off
Fault memory and activation of Check Engine (MIL)	–
Test frequency	–
Tested signal or condition	–
Plausibility	–

Diagnosis – Diagnostic Trouble Code (DTC) Memory

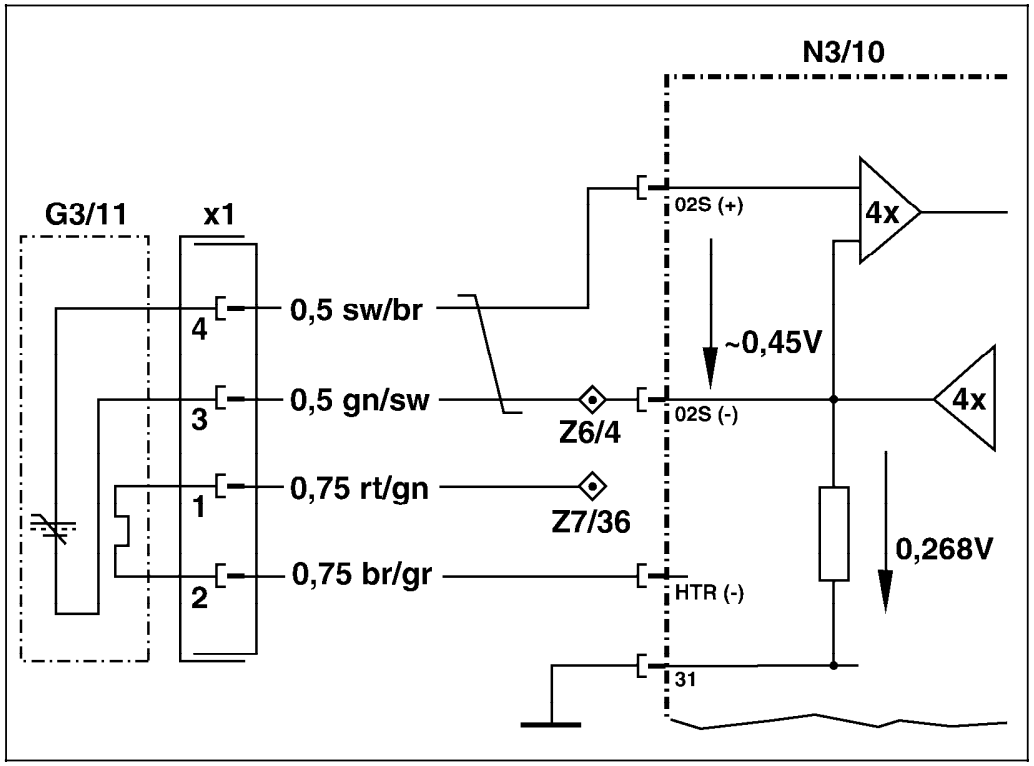
Figure 1

02 sensor voltage as shown on engine 137

G/3 Sensor signal sensitivity ok
X1 Connector
1 Circuit 78 Sensor heating
2 Sensor heating ground
3 Sensor signal ground
4 Sensor signal (approx. 0.45 V at λ = 1 and 02 sensor at operating temperature.

N3/10 control module ME
4X measurement amplifier for sensor signal and sensor ground evaluation switching
0.268 V opposite voltage based on ground circuit 31

Z6/4 Connector socket sensor signal ground
(4 02 senosrs, engine 137 only)
Z7/36 Connector socket circuit 87



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Diagnosis – Diagnostic Trouble Code (DTC) Memory

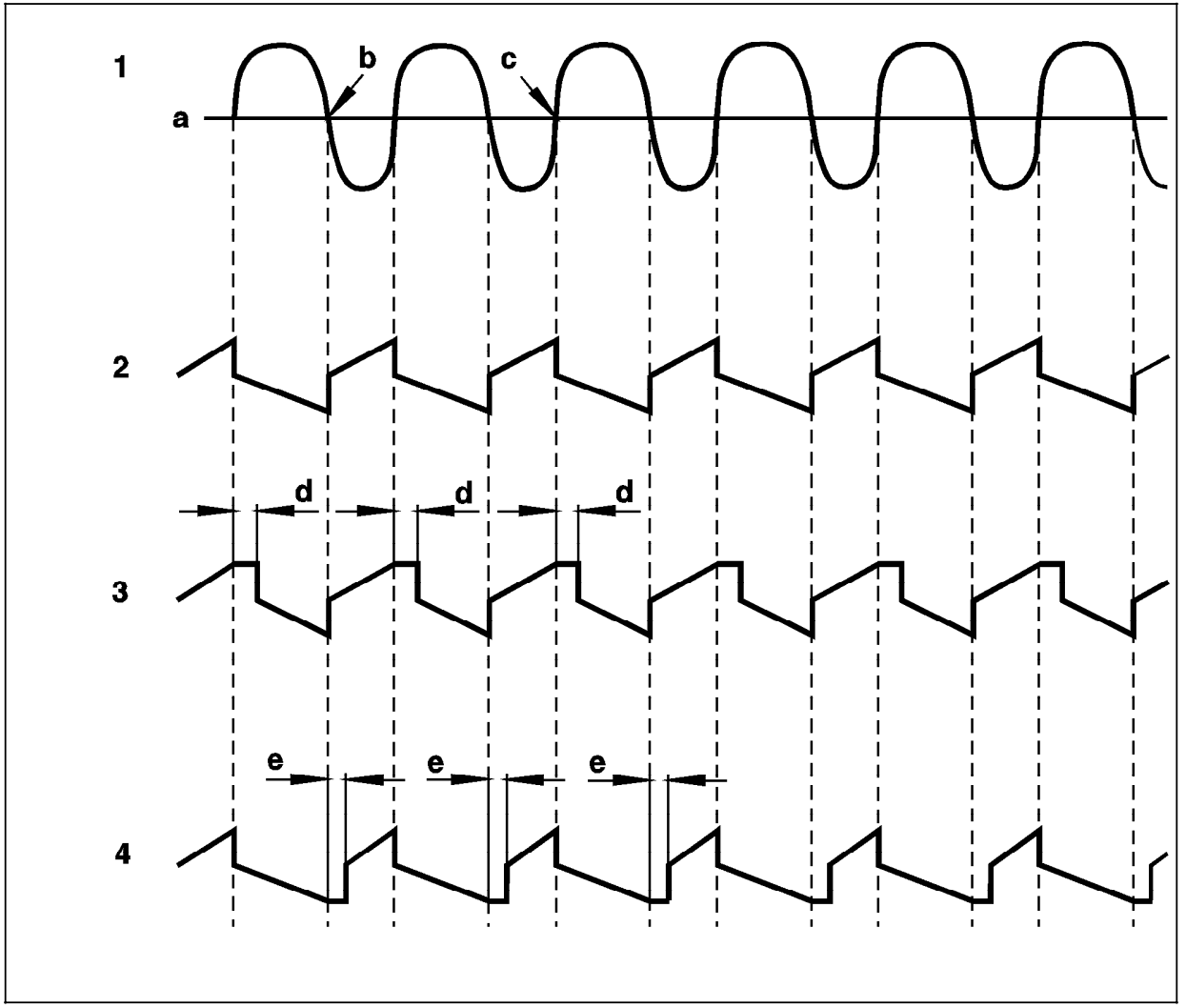

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Figure 2
Two 02 sensor regulation

1 02 sensor signal before CAT.
a Voltage peak for Rich - lean changeover (B) or
Lean - rich changeover (c)

2 Lambda regulation without correction

3 Lambda regulation with correction (d), time delay (+TV) towards Rich

4 Lambda regulation with correction (e), time delay (+TV) towards Lean

Diagnosis – Diagnostic Trouble Code (DTC) Memory

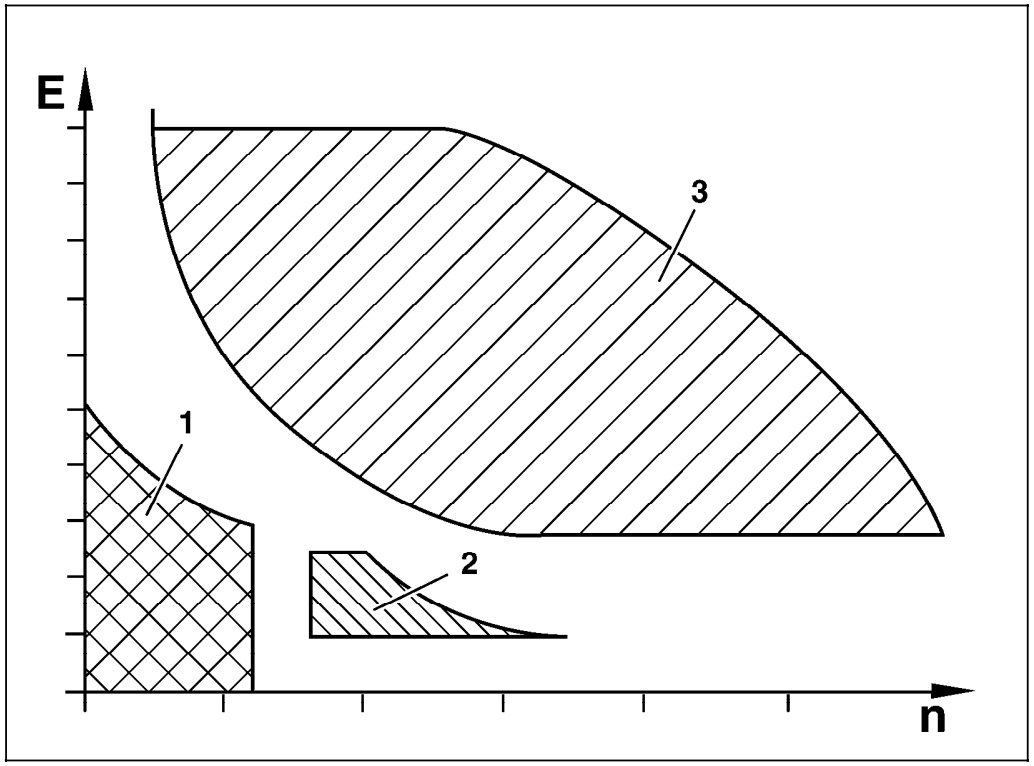

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Figure 3
Fuel mixture - self adaption

1 Idle range
2 Range between idle and part load
3 Part load range

E Injection amount
n Engine rpm

Diagnosis – Diagnostic Trouble Code (DTC) Memory

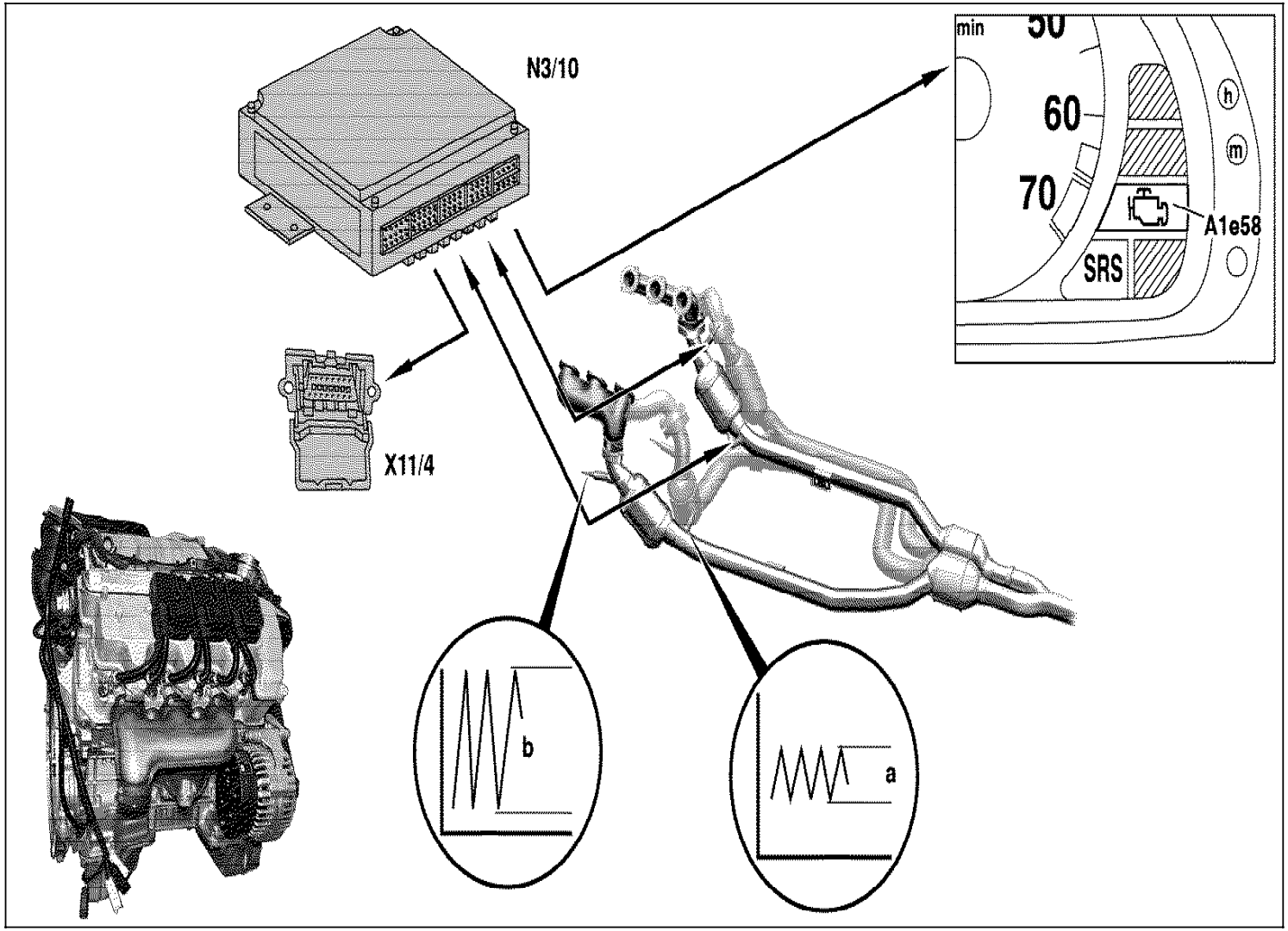


Figure 4

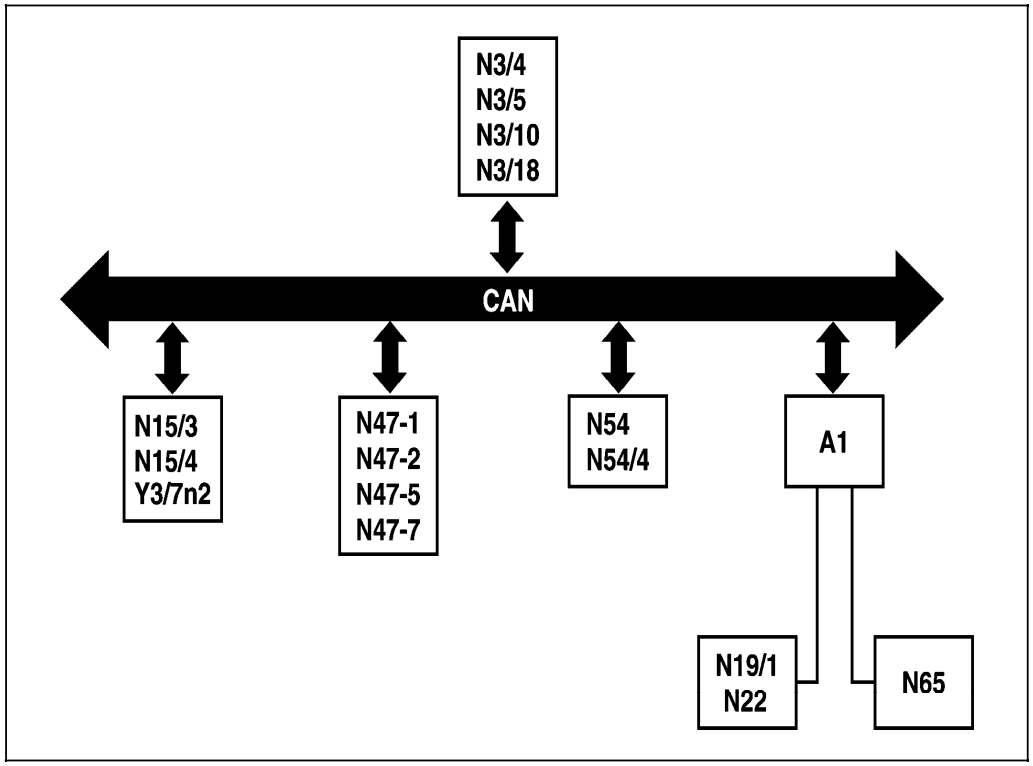
Engine 112 (not (USA)) **shown**

A1e58	Engine diagnostic indicator lamp
N3/10	Control module ME
X11/4	Data link connector (DTC readout
a	Amplitude of 02 sensor signal after CAT
b	Amplitude of 02 sensor signal before CAT

P49.10-2116-09

Diagnosis – Diagnostic Trouble Code (DTC) Memory

Figure 5
Engine CAN data bus
Models 129, 140, 163, 170, 202, 203, 208 210



P54.18-2146-75

A1	Instrument cluster
N3/4	Engine control module (HFM-SFI)
N3/5	Engine maangement monolith control module (not USA)
N3/10	Engine control module (ME-SFI)
N15/3	ETC control module
N15/4	Automatic clutch control module (not USA)
N19/1	A/C pushbutton control module
N22	AAC control unit and module
N47-1	ASR/SPS control module
N47-2	ETS/SPS control module
N47-5	ESP/BAS control module
N47-7	ABS control module
N54	RCL control module
N54/4	DAS radio frequency/infrared control module
N65	Pulse module (traction systems, HCS,ATA, AAC)
Y3/7n2	FWD control module (not USA)