9.5 Engine 119

Diagnosis - Diagnostic Trouble Code (DTC) Memory

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

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.

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.

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 > 80° C.

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

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.

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 automatically performs a mixture adjustment.

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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 at idle speed is ± 1.0 milliseconds (injection duration) and at partial load the factor is 0.77 - 1.28. After repair work is performed, the engine control module ME 1.0 will automatically adapt itself again.

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).
The following vehicle version data must be determined for coding:

- Vehicle model,
- Catalytic converter (TWC),
- Non-catalytic converter (non-TWC),
- Country version.

Note regarding drive authorization system (DAS) stage 2 and stage X:
Vehicles with ME-SFI are equipped with a drive authorization system (DAS). The activation/deactivation of the drive authorization system takes place from the RCL control module (stage 2) or from the DAS control module (stage X) via CAN data bus to the engine contro9l module (ME-SFI). After activating the drive authorization system, the engine control module renders the fuel injection system inoperative.

On vehicles till 05/96 a drive authorization system stage 2 is installed. This drive authorization system can only be activated/deactivated with the IR transmitter or the master key.

On vehicles as of 06/96 a drive authorization system stage X is installed. The activation or deactivation is accomplished with transponder technology via the ignition key. As soon as the ignition key is turned in the steering lock the DAS control module receives a signal and the fuel injection system is made operative via the CAN data bus.

The engine control module and the RCL or the DAS control module are "locked" 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 and RCL or DAS control modules from one vehicle to another is not possible!

⚠
If an exchange engine control module is installed for test purposes, only 40 start attempts can be perfromed before the engine and RCL or DAS control modules "lock" 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).

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Notes regarding automatic recognition of the mechanical end stop and wide open position of the throttle valve from the actuators:
The end stops of the throttle valves are 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 throttle position must be determined and recorded.
After connecting the new engine control module 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 at rest,
- 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 the engine control module after interruption of voltage supply, circuit 30:
If a rough running engine is noticed after a voltage interruption, the following conditions must be met:
- Engine coolant temperature approx. > 80 °C,
- Drive vehicle on dynamometer in selector lever position 4 or on the road in selector lever position 3.
- Increase engine rpm to approx. > 3500 rpm and then coast until engine rpm is approx. < 1200 rpm.
- Repeat procedure at least 3 times.

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 proceed as follows:

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

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

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

Diagnosis - Diagnostic Trouble Code (DTC) Memory

Notes regarding activation of CHECK ENGINE MIL

With combustion misses (e.g. ignition or fuel mixture) the CHECK ENGINE MIL is activated intermitantly (blinking). Affected are the DTC's P0 300 to P0 308.
With all other malfunctions, the MIL is iluminated continuously.

Notes regarding CKP sensor (L5) adaption

After the replacement of the ME-SFI control module and for the uneven running engine test, the toothed wheel sensor (CKP sensor) adaption must be performed as follows:

- ECT approx. 70°C
- Drive vehicle with transmission selector lever in 3rd gear
- Increase engine rpm to> 3500 rpm and then coast until engine rpm attains 1200 rpm.

After the replacement of the CKP sensor (L5), the starter ring gear or the replacement of the engine, the toothed wheel sensor (CKP sensor) adaption must be first reset using the HHT, then perform the driving cycle as indicated above.

Diagnosis - Diagnostic Trouble Code (DTC) Memory

Notes for 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.

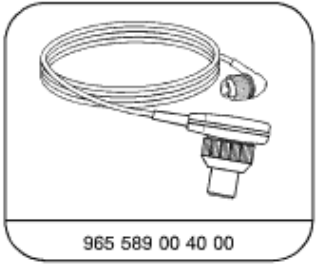
- **Drive authorization system (DAS)**
  Upon replacement of the engine control module it must be version coded using the HHT. Additionally, the code number and VIN must be entered (see HHT nominal values “DAS”, menu selection 3/7).

Diagnosis - Diagnostic Trouble Code (DTC) Memory

Special Tools

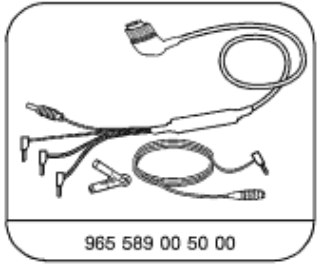
965 589 00 01 00

Hand-Held-Tester



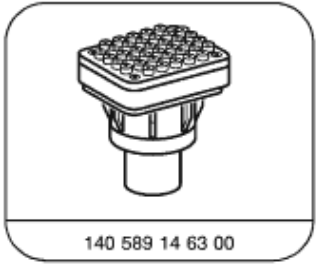
965 589 00 40 00

Test cable



965 589 00 50 00

Adapter cable



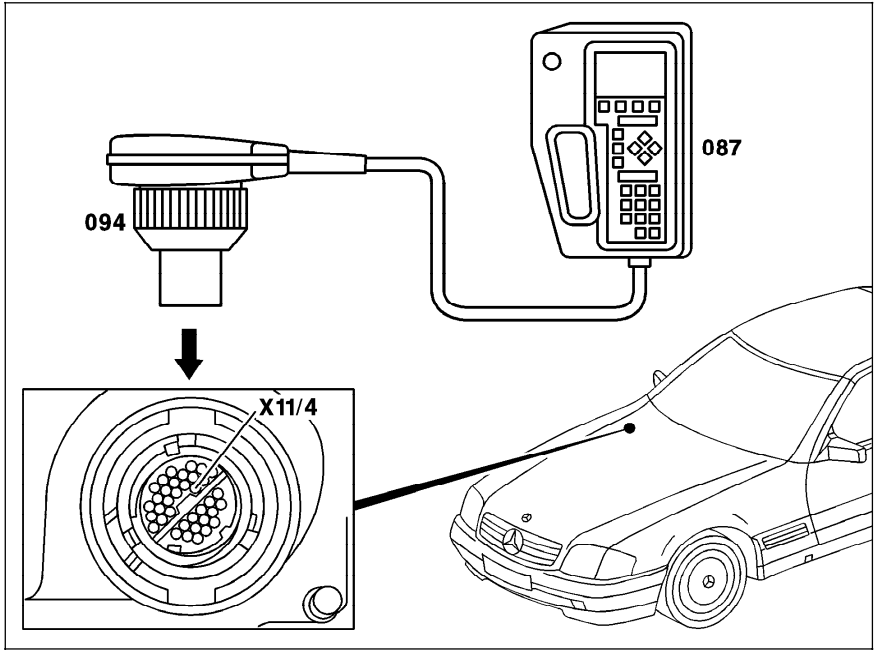
140 589 14 63 00

Adapter

Diagnosis - Diagnostic Trouble Code (DTC) Memory

Connection Diagram - Hand-Held Tester (HHT)

Engine control module (N3/10)	socket 4
RPM signal (TN)	socket 13



P07-6751-57

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

1. Connect Hand-Held Tester to data link connector (DTC readout) (X11/4) according to connection diagram (see 11/7)
2. Ignition: **ON**

⚠
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 failure was recognized.

ℹ Before starting with test observe Trouble Code Description ≫.

DTC	Possible cause		DTC Description	Test step/Remedy [1]
	SAE nomenclature	Explanation		
–	No malfunction in system			In case of complaint, perform 23, 24, 25 or 26 in its entirety
P0100	MAF circuit malfunction	Hot film MAF sensor (B2/5)	13 ≫ **1**	23⇒ 4.0 – 5.0
P0105	MAP circuit malfunction	Pressure sensor (B28)	13 ≫ **2**	23⇒ 6.0
P0110	IAT circuit malfunction	IAT sensor (B17)	13 ≫ **3**	23⇒ 9.0
P0115	ECT circuit malfunction	ECT sensor (B11/4)	13 ≫ **4**	23⇒ 8.0
P0120	Throttle position circuit malfunction	Actual value potentiometer in EA/CC/ISC actuator (M16/1)	13 ≫ **5**	25⇒ 6.0
P0130	O2S 1 circuit malfunction, bank 1 (right)	Right O2S 1 (before TWC) (G3/4)	13 ≫ **6**	23⇒ 12.0

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	Possible cause		DTC Description	Test step/Remedy [1]
	SAE nomenclature	Explanation		
P0133	O2S 1 circuit slow response, bank 1 (right)	A Right O2S 1 (before TWC) (G3/4), ageing correction value exceeded B Right O2S 1 (before TWC) (G3/4), ageing time period too long	13 ⩾ **7**	23⇒ 12.0
P0135	O2S 1 heater circuit malfunction, bank 1 (right)	Right O2S 1 heater (before TWC) (G3/4)	13 ⩾ **8**	23 ⇒ 13.0
P0136	O2S 2 circuit malfunction, bank 1 (right)	Right O2S 2 (after TWC) (G3/6)	13 ⩾ **6**	23 ⇒ 15.0
P0141	O2S 2 heater circuit malfunction, bank 1 (right)	Right O2S 2 heater (after TWC) (G3/6)	13 ⩾ **8**	23⇒ 16.0
P0150	O2S 1 circuit malfunction, bank 2 (left)	Left O2S 1 (before TWC) (G3/3)	13 ⩾ **6**	23⇒ 11.0
P0153	O2S 1 circuit slow response, bank 2 (left)	A Left O2S 1 (before TWC) (G3/3), ageing correction value exceeded B Left O2S 1 (before TWC) (G3/3), ageing time period too long	13 ⩾ **7**	23⇒ 11.0
P0155	O2S 1 heater circuit malfunction, bank 2 (left)	Left O2S 1 heater (before TWC) (G3/3)	13 ⩾ **8**	23⇒ 13.0
P0156	O2S 2 circuit malfunction, bank 2 (left)	Left O2S 2 (after TWC) (G3/5)	13 ⩾ **6**	23⇒ 14.0
P0161	O2S 2 heater circuit malfunction, bank 2 (left)	Left O2S 2 heater (after TWC) (G3/5)	13 ⩾ **8**	23⇒ 16.0

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	Possible cause		DTC Description	Test step/Remedy [1]
	SAE nomenclature	Explanation		
P0170	Fuel trim malfunction	A Self adaptation of fuel mixture "partial load" of right cylinder bank at limit from engine control module (N3/10). B Self adaptation of fuel mixture "CTP" of right cylinder bank at limit from engine control module (N3/10).	13 ⩾ **9**	Intake air leak, injectors, diaphragm pressure regulator, engine wear.
P0173	Fuel trim malfunction	A Self adaptation of fuel mixture "partial load" of left cylinder bank at limit from engine control module (N3/10). B Self adaptation of fuel mixture "CTP" of left cylinder bank at limit from engine control module (N3/10).	13 ⩾ **9**	Intake air leak, injectors, diaphragm pressure regulator, engine wear.
P0201	Injector circuit malfunction - cyl. 1	Injector (Y62y1) – cylinder 1	13 ⩾ **10**	23⇒ 17.0
P0202	Injector circuit malfunction - cyl. 2	Injector (Y62y2) – cylinder 2	13 ⩾ **10**	23⇒ 18.0
P0203	Injector circuit malfunction - cyl. 3	Injector (Y62y3) – cylinder 3	13 ⩾ **10**	23 ⇒ 19.0
P0204	Injector circuit malfunction - cyl. 4	Injector (Y62y4) – cylinder 4	13 ⩾ **10**	23 ⇒ 20.0
P0205	Injector circuit malfunction - cyl. 5	Injector (Y62y5) – cylinder 5	13 ⩾ **10**	23 ⇒ 21.0
P0206	Injector circuit malfunction - cyl. 6	Injector (Y62y6) – cylinder 6	13 ⩾ **10**	23 ⇒ 22.0
P0207	Injector circuit malfunction - cyl. 7	Injector (Y62y7) – cylinder 7	13 ⩾ **10**	23 ⇒ 23.0
P0208	Injector circuit malfunction - cyl. 8	Injector (Y62y8) – cylinder 8	13 ⩾ **10**	23 ⇒ 24.0

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	Possible cause		DTC Description	Test step/Remedy [1]
	SAE nomenclature	Explanation		
P0300	Random misfire detected	A Random misfire B Random misfire, TWC damaging	13 ⩾ **11**	Smooth running Sensor gear adaption Mixture adaptation Fault freeze frame data readout using HHT
P0301	Cylinder 1 misfire detected	A Cylinder 1 misfire B Cylinder 1 misfire, TWC damaging	13 ⩾ **11**	24 ⇒ 22.0 24 ⇒ 30.0 36 ⇒ 1.0 – 2.0 Compression pressure
P0302	Cylinder 2 misfire detected	A Cylinder 2 misfire B Cylinder 2 misfire, TWC damaging	13 ⩾ **11**	24 ⇒ 23.0 24 ⇒ 30.0 36 ⇒ 1.0 – 2.0 Compression pressure
P0303	Cylinder 3 misfire detected	A Cylinder 3 misfire B Cylinder 3 misfire, TWC damaging	13 ⩾ **11**	24 ⇒ 24.0 24 ⇒ 30.0 36 ⇒ 1.0 – 2.0 Compression pressure
P0304	Cylinder 4 misfire detected	A Cylinder 4 misfire B Cylinder 4 misfire, TWC damaging	13 ⩾ **11**	24 ⇒ 25.0 24 ⇒ 30.0 36 ⇒ 1.0 – 2.0 Compression pressure

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	Possible cause		DTC Description	Test step/Remedy [1]
	SAE nomenclature	Explanation		
P0305	Cylinder 5 misfire detected	A Cylinder 5 misfire B Cylinder 5 misfire, TWC damaging	13 ⩾ **11**	24 ⇒ 26.0 24 ⇒ 30.0 36 ⇒ 1.0 – 2.0 Compression pressure
P0306	Cylinder 6 misfire detected	A Cylinder 6 misfire B Cylinder 6 misfire, TWC damaging	13 ⩾ **11**	24 ⇒ 27.0 24 ⇒ 30.0 36 ⇒ 1.0 – 2.0 Compression pressure
P0307	Cylinder 7 misfire detected	A Cylinder 7 misfire B Cylinder 7 misfire, TWC damaging	13 ⩾ **11**	24 ⇒ 28.0 24 ⇒ 30.0 36 ⇒ 1.0 – 2.0 Compression pressure
P0308	Cylinder 8 misfire detected	A Cylinder 8 misfire B Cylinder 8 misfire, TWC damaging	13 ⩾ **11**	24 ⇒ 29.0 24 ⇒ 30.0 36 ⇒ 1.0 – 2.0 Compression pressure
P0325	KS 1 circuit malfunction (right side of engine)	Right KS 1 (A16g1)	13 ⩾ **12**	Wiring, connector, A16 g1
P0330	KS 2 circuit malfunction (left side of engine)	Left KS 2 (A16g2)	13 ⩾ **12**	Wiring, connector, A16 g2

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC		Possible cause		DTC Description	Test step/Remedy [1]
		SAE nomenclature	Explanation		
P0335		CKP sensor circuit malfunction	CKP sensor (L5)	13 ≫ **13**	24 ⇒ 12.0
P0341		CMP sensor circuit range/performance	Camshaft Hall-effect sensor (B6/1)	13 ≫ **14**	24 ⇒ 13.0
P0410	Only (USA)	Air injection system malfunction	AIR system malfunction (logic chain)	13 ≫ **15**	23 ⇒ 25.0 – 26.0
P0422		TWC efficiency below threshold, right	Right TWC efficiency below threshold	13 ≫ **16**	Replace right TWC
P0432		TWC efficiency below threshold, left	Left TWC efficiency below threshold	13 ≫ **16**	Replace left TWC
P0440	Only (USA) **Mod.140/210 and 129 as of 09/97**	EVAP system malfunction	EVAP leaking (logic chain)	13 ≫ **17**	23 ⇒ 31.0 – 33.0
P0441		EVAP system incorrect purge flow	EVAP not functioning	13 ≫ **18**	23 ⇒ 31.0 – 32.0
P0442	Only (USA) **Mod. 140/210 and 129 as of 09/97**	EVAP system leak detected (small leak)	EVAP system, small leak	13 ≫ **17**	23 ⇒ 33.0
P0443		EVAP system purge control valve circuit malfunction	Purge control valve (Y58/1)	13 ≫ **19**	23 ⇒ 31.0
P0446	Only (USA) **Mod. 140/210 and 129 as of 09/97**	EVAP system vent control malfunction	A Charcoal canister shut-off valve, output stage B Charcoal canister shut-off valve (Y58/4)	13 ≫ **20**	23 ⇒ 31.0 23 ⇒ 33.0 23 ⇒ 35.0 23 ⇒ 34.0

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC		Possible cause		DTC Description	Test step/Remedy [1]
		SAE nomenclature	Explanation		
P0450	Only (USA) **Mod. 140/210 and 129 as of 09/97**	EVAP system pressure sensor malfunction	Fuel tank pressure sensor (B4/3)	13 ⩾ **21**	23 ⇒ 35.0 Charcoal canister plugged.
	Only (USA) **Model 129 up to 08/97**		Purge monitoring pressure sensor (B4/4)	13 ⩾ **22**	23 ⇒ 36.0
P0455	Only (USA) **Mod. 140/210 and 129 as of 09/97**	EVAP system leak detected (large leak)	EVAP system, large leak Fuel tank press. sensor (B4/3)	13 ⩾ **17** 13 ⩾ **21**	23 ⇒ 33.0 23 ⇒ 35.0
P0462		Fuel level sensor circuit low input	Fuel tank level too low		Fill fuel tank
P0500		VSS sensor malfunction	A VSS left front B VSS left rear	13 ⩾ **23**	25 ⇒ 8.0 25 ⇒ 9.0
P0507		ISC rpm higher than expected	Idle control system	13 ⩾ **24**	25 ⇒ 4.0 – 7.0
P0560		System voltage malfunction	Voltage supply to engine control module (N3/10)	13 ⩾ **25**	23 ⇒ 1.0 – 3.0
P0565		Cruise control switch	CC switch (S40)		26 ⇒ 1.0

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	Possible cause		DTC Description	Test step/Remedy [1]
	SAE nomenclature	Explanation		
P0600	Serial communication link malfunction	CAN bus from ESP/SPS control module (N47-5)	13 ⩾ **26**	23 ⇒ 37.0
P0604	Internal control module random Access memory (RAM) error	A Control module B Control module		(N3/10)
P0605	Internal control module random Access memory (RAM) error	Engine control module (N3/10)		(N3/10)
P0700	Transmission control system malfunction	Read DTC memory of transmission control module	13 ⩾ **27** 13 ⩾ **28**	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.
P0702	Transmission control system electrical	Read DTC memory of transmission control module	13 ⩾ **29** 13 ⩾ **30**	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.
P0715	Input/turbine speed sensor circuit malfunction	Read DTC memory of transmission control module	13 ⩾ **31**	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.
P0720	Output speed sensor circuit malfunction	Read DTC memory of transmission control module	13 ⩾ **32**	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	Possible cause		DTC Description	Test step/Remedy [1]
	SAE nomenclature	Explanation		
P0730	Incorrect gear ratio	Read DTC memory of transmission control module	13 ≫ **33**	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.
P0740	Torque converter clutch system malfunction	Read DTC memory of transmission control module	13 ≫ **34**	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.
P0743	Torque converter clutch system electrical	Read DTC memory of transmission control module	13 ≫ **35**	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.
P0748	Pressure control solenoid electrical	Read DTC memory of transmission control module	13 ≫ **36** 13 ≫ **37**	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.
P0753	Shift solenoid A electrical	Read DTC memory of transmission control module	13 ≫ **38**	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.
P0758	Shift solenoid B electrical	Read DTC memory of transmission control module	13 ≫ **39**	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.
P0763	Shift solenoid C electrical	Read DTC memory of transmission control module	13 ≫ **40**	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	Possible cause		DTC Description	Test step/Remedy [1]
	SAE nomenclature	Explanation		
P0809	Angle deviation between camshaft and crankshaft	Angle deviation between camshaft and crankshaft		Check basic adjustment of camshaft
P1163	Oil level switch	Oil level switch (S43)		23 ⇒ 39.0
P1186	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.
P1386	Knock sensor control from ECM (N3/10) at end stop	Knock sensor control in engine control module (N3/10) hardware failure	13 ⩾ **41**	1. Increased knock tendency due to bad fuel, carbon in combustion chamber or mechanical damage. 2. Engine control module (N3/10)
P1420 Only (USA)	AIR pump switchover valve	AIR pump switchover valve (Y32)	13 ⩾ **42**	23 ⇒ 26.0
P1453 Only (USA)	AIR relay module	AIR relay module (K17)	13 ⩾ **42**	23 ⇒ 25.0

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	Possible cause		DTC Description	Test step/Remedy [1]
	SAE nomenclature	Explanation		
P1519	Right adjustable camshaft timing solenoid	Right adjustable camshaft timing solenoid (Y49/2) (logic chain)	13 ≫ **43**	23 ⇒ 28.0
P1522	Left adjustable camshaft timing solenoid	Left adjustable camshaft timing solenoid (Y49/1) (logic chain)	13 ≫ **43**	23 ⇒ 27.0
P1525	Right adjustable camshaft timing solenoid	Right adjustable camshaft timing solenoid (Y49/2)	13 ≫ **44**	23 ⇒ 30.0
P1533	Left adjustable camshaft timing solenoid	Left adjustable camshaft timing solenoid (Y49/1)	13 ≫ **44**	23 ⇒ 29.0
P1542	Pedal value sensor	Pedal value sensor (B37)	13 ≫ **45**	25 ⇒ 4.0 - 5.0

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	Possible cause		DTC Description	Test step/Remedy [1]
	SAE nomenclature	Explanation		
P1 570 [2]	A. Start attempt performed with RCL locked B. CAN signal from DAS control module to engine control module C. Engine control module (ME-SFI) and DAS control module are not compatible	A. Start attempt performed with RCL locked. 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.		Check for correct operation of DAS, DM, Body and Accessories, Vol. 1, section 4.8 Check control modules and part no.
P1 580	EA/CC/ISC actuator	EA/CC/ISC actuator (M16/1)	13 ≫ **46**	25 ⇒ 7.0
P1 584	Stop lamp switch	Stop lamp switch (S9/1)		26 ⇒ 2.0
P1 605	Body acceleration sensor	Body acceleration sensor (B24) (up to 05/96) Poor road/traction condition recognition signal (via comparison of VSS rpm signals) (as of 06/96)	13 ≫ **47**	23 ⇒ 42.0 Test ASR/ESP see DM, Chassis and Drivetrain, Vol. 3, Section 9, 10
P1 747	CAN signal from ETC	CAN signal from ETC (N15/3) interrupted	13 ≫ **26**	23 ⇒ 37.0

1) Observe Preparation for Test, see 22.
2) The DTC PI 570 can be displayed on model 140 vehicles produced between 09/95 and 11/95 even if no malfunction is present.

Diagnosis – Complaint Related Diagnostic Chart – Injection/Ignition

Complaint/Problem	Possible cause	Test step/Remedy [1]	Actual value Engine test Menu item
Engine starts and accelerates poorly when cold	Injector (Y62) activation and injection duration.	23 ⇒ 17.0 – 24.0	2/7
	Hot film MAF sensor (B2/5).	23 ⇒ 4.0 – 5.0	1/7
	ECT sensor (B11/4).	23 ⇒ 8.0	3/7
	Ignition voltage too low.	24 ⇒ 30.0	–
	Intake air leak.	Remedy leak.	–
Engine does not start	No voltage supply from base module (N16/1).	23 ⇒ 1.0 – 3.0	–
	Malfunction of drive authorization system (DAS) .	23 ⇒ 37.0	DAS 1/1
	Fuel pumps defective.	34 ⇒ 2.0	–
	No compression, oil pressure too high.	check compression and oil pressure.	–
	Ignition voltage too low.	24 ⇒ 30.0	–
Engine has uneven idle	Camshaft timing.	23 ⇒ 27.0 – 30.0	2/7
	Injector (Y62) activation and injection duration.	23 ⇒ 17.0 – 24.0	2/7
	Intake air leak.	Remedy leak.	–
Engine has insufficient output	TWC flow restricted.	Check exhaust back pressure, see DM, Engines, Vol. 1, section A, “Engine Output“	–
	Left or right O2S 1 (G3/3 or G3/4) (before TWC).	23 ⇒ 11.0 – 12.0	5/7
	ECT sensor (B11/4).	23 ⇒ 8.0	3/7
	Hot film MAF sensor (B2/5).	23 ⇒ 4.0 – 5.0	1/7
	Camshaft timing.	23 ⇒ 27.0 – 30.0	2/7

[1] Observe Preparation for Test, see 22.

Diagnosis – Complaint Related Diagnostic Chart – Injection/Ignition

Complaint/Problem	Possible cause	Test step/Remedy [1]	Actual value Engine test Menu item
Engine runs unevenly (shakes)	Injector (Y62) activation and injection duration. Injector leaking, poor spray pattern. Left or right O2S 1 (G3/3 or G3/4) (before TWC). Ignition voltage too low. Compression on one or more cylinders too low. Intake air leak.	23 ⇒ 17.0 – 24.0 36 ⇒ 1.0 23 ⇒ 11.0 – 12.0 24 ⇒ 30.0 Check compression. Remedy leak.	2/7 – 5/7 – – –
Engine runs unevenly (misfiring)	Ignition voltage too low. Hot film MAF sensor (B2/5).	24 ⇒ 30.0 23 ⇒ 4.0 – 5.0	– 1/7
Engine surges after cold start	Intake air leak.	Remedy leak.	–
Transition failure during warm-up	ECT sensor (B11/4). Hot film MAF sensor (B2/5). Intake air leak.	23 ⇒ 8.0 23 ⇒ 4.0 – 5.0 Remedy leak.	3/7 1/7 –
Transition failure when warm or high fuel consumption	Left or right O2S 1 (G3/3 or G3/4) (before TWC). Purge control valve (Y58/1) stuck in open position.	23 ⇒ 11.0 – 12.0 23 ⇒ 31.0	5/7 3/7
Engine vibrates	Hot film MAF sensor (B2/5). Ignition voltage too low. Left or right O2S 1 (G3/3 or G3/4) (before TWC).	23 ⇒ 4.0 – 5.0 24 ⇒ 30.0 23 ⇒ 11.0 – 12.0	1/7 – 5/7
EPC MIL (A1e43) illuminates and EA is in “limp-home” mode	Nominal value potentiometer in pedal value sensor (B37). EA/CC/ISC actuator actual value potentiometer.	25 ⇒ 4.0 – 5.0 25 ⇒ 6.0 – 7.0	4/7 4/7

[1] Observe Preparation for Test, see 22.

Diagnosis – Trouble Code Description

⩾1		Hot film MAF sensor (B2/5)
1	OBD trouble code	P0100
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Continuously
4	Checked signal or condition	Hot film MAF sensor signal threshold values
5	Lower threshold value Upper threshold value Plausibility Test duration per threshold value	approx. 0.4 V approx. 6 V The air mass can not deviate more than approx. 130% from the theoretically required air mass (stored map, engine rpm dependent) < 5 seconds

Diagnosis – Trouble Code Description

≫ 2		**Pressure sensor (B28)**
1	OBD trouble code	P0105
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Continuously
4	Checked signal or condition	Pressure sensor signal threshold value (intake manifold pressure)
5	Lower threshold value Upper threshold value During deceleration Test duration per threshold value	approx. 0.27 V approx. 4.9 V > approx. 2.5 V < 5 seconds

Diagnosis – Trouble Code Description

≫ 3		IAT sensor (B17)
1	OBD trouble code	P0110
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Continuously
4	Checked signal or condition	Intake air temperature threshold values
5	Lower threshold value Upper threshold value Test duration per threshold value	> 300 kΩ (approx. –50 °C) < 150 Ω (approx. +125 °C) < 1 second
6	Note	In case of a fault driving continues with the substitude value of +20 °C. If the signal is plausible again, a switchover to the signal of the IAT sensor occurs.

Diagnosis – Trouble Code Description

⩾ 4		ECT sensor (B11/4)
1	OBD trouble code	P0115
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Continuously
4	Checked signal or condition	Engine coolant temperature threshold values
5	Lower threshold value Upper threshold value Test duration per threshold value Plausibility	> 50 kΩ (approx. –38 °C) < 50 Ω (approx. +160 °C) < 1 second The temperature rise after the cold start is compared to a stored temperature pattern (map). After a predetermined time a temperature of at least +38 °C must be reached.
	Note	In case of a fault driving continues with the substitude value from the temperature pattern. If the signal is again plausible, a switchover to the signal of the ECT sensor occurs.

Diagnosis – Trouble Code Description

⩾5		Actual value potentiometer in EA/CC/ISC actuator (M16/1)
1	OBD trouble code	P0120
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Continuously
4	Checked signal or condition	Threshold value of potentiometers M16/1r1 or M16/1r2
5	Reference potentiometer M16/1r1 Lower threshold value Upper threshold value Actual value potentiometer M16/1r2 Lower threshold value Upper threshold value	 <0.355 V >4.765 V <0.295 V >4.63 V

Diagnosis – Trouble Code Description

⩾6		O_2 sensor signal
1	OBD trouble code	P0130 Right O2S 1 (before TWC) (G3/4) P0136 Right O2S 2 (after TWC) (G3/6) P0150 Left O2S 1 (before TWC) (G3/3) P0156 Left O2S 2 (after TWC) (G3/5)
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Continuously
4	Checked signal or condition	A. O_2 sensor signal threshold value B. Change of O_2 sensor condition
5	A. O_2 sensor signal threshold value Lower threshold value Upper threshold value Test duration B. Change of O_2 sensor condition	 < – 0.15 V >1.5 V < 5 seconds After approx. 220 seconds with energized O_2 sensor heater, the O_2 sensor signal must not remain longer than 5 seconds in the voltage window of 0.4 – 0.6 V.
6	Prerequisite for test	– Engine speed approx. 1000 – 2000 rpm – Load approx. 15 – 50% – TWC temperature > approx. 300 °C – Lambda control released
7	Note	All electricaal connection faults of the O_2 sensors before TWC or after TWC (open or short circuit towards ground or battery voltage) are recognized with this test.

Diagnosis – Trouble Code Description

⩾7		**A. O2 sensor ageing correction value exceeded** **B. O2 sensor ageing time period too long**
1	OBD trouble code	P0133 Right O2S 1 (before TWC) (G3/4) P0153 Left O2S 1 (before TWC) (G3/3)
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Continuously
4	Checked signal or condition	A. Correction value exceeded B. Time period too long
5	A. Correction value threshold value B. Time period threshold value Test duration	Approx. ± 1.2 seconds > approx. 5 seconds (average value from 15 measurements) < 80 seconds
6	Prerequisite for test	– Engine speed approx. 1000 – 2000 rpm – Load approx. 15 – 50% – TWC temperature > approx. 300 °C – Lambda control released – No fault with TWC operation – No fault with O_2 sensor heater
7	Test sequence	The O_2 sensors after the TWC are required for the monitoring of the catalyst effectiveness and improvement of the lambda control (two sensor control). The lambda mean value is established from O_2 sensor signals and from it a correction value is determined for the lambda control. With the correction value (value for new O_2 sensor approx. 0) the aging of the O_2 sensor before the TWC is compensated for in a certain degree. If the correction value exceeds the threshold value the O_2 sensor before the TWC must be replaced. Additionally, the time period of the O_2 sensor signal is evaluated.
8	Note	Time period of the O_2 sensor before TWC too long: O_2 sensor after TWC is no longer monitored. Correction value of the O_2 sensor before TWC exceeded: O_2 sensor after TWC is further monitored. If faults are recognized simultaneously for the O_2 sensor before TWC and after TWC, only the O_2 sensor after TWC is defective in most cases.

Diagnosis – Trouble Code Description

≫ 8		O2 sensor heater
1	OBD trouble code	P0135 Right O2S 1 (before TWC) (G3/4) P0141 Right O2S 2 (after TWC) (G3/6) P0155 Left O2S 1 (before TWC) (G3/3) P0161 Left O2S 2 (after TWC) (G3/5)
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Continuously
4	Checked signal or condition	Calculated resistance value of O_2 sensor heater
5	Lower threshold value Upper threshold value	< approx. 2.0 Ω (corresponds to approx. 6 A at 12 V) > approx. 9.2 Ω (corresponds to approx. 1.3 A at 12 V)
6	Note	The O_2 sensor heater of the O2 sensor before TWC and after TWC are connected in parallel.
7	Prerequisite for test	O_2 sensor heater ON and heating period of approx. 220 seconds expired.

Diagnosis – Trouble Code Description

⩾ 9		**A. Self adaptation of fuel mixture "partial load" at limit from engine control module (N3/10)** **B. Self adaptation of fuel mixture "CTP" at limit from engine control module (N3/10)**
1	OBD trouble code	P0170 Right cylinder bank P0173 Left cylinder bank
2	Storage of DTC and activation of CHECK ENGINE MIL	The DTC storage takes place immediately Activation of the CHECK ENGINE MIL takes place after two consecutive trips with fault
3	Monitoring time and frequency of test	Continuously
4	Checked signal or condition	Self-adaptation of fuel mixture threshold value
5	A. CTP threshold value B. Partial load threshold value	Approx. ± 1.0 ms (corresponds to approx. 20% of the injection duration at idle) 0.77 – 1.28 factor
6	Note	In order to obtain a new value for the self-adaptation of the fuel mixture a trip of approx. 30 minutes is required. When starting the engine the ECT must be < 60 °C.

Diagnosis – Trouble Code Description

≫ 10		Injectors (Y62)
1	OBD trouble code	P0201 – P0208
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Continuously
4	Checked signal or condition	Current or voltage test at the individual injector
5	Current draw threshold value Voltage threshold value Test duration	> 4.2 A < 2.5 V < 5 seconds
6	Note	The activation of each injector is tested for open and short circuit (towards ground or battery). In case of a fault the final stage is immediately no longer activated. ⚠ With a short towards ground the corresponding injector remains continuously open.

Diagnosis – Trouble Code Description

⩾ 11		**A. Misfire** **B. Misfire, TWC damaging**
1	OBD trouble code	P0300 Misfires P0301 – P0308 Misfire, assigned to individual cylinder
2	Storage of DTC and activation of CHECK ENGINE MIL	A. Misfire (emission limit) Ignition misfire within 1000 engine revolutions. CHECK ENGINE MIL is activated after two consecutive trips with fault B. Misfire "TWC damaging" Ignition misfire within 200 engine revolutions. CHECK ENGINE MIL is activated intermittant (blinking) immediately with ignition misfire.
3	Monitoring time and frequency of test	Continuously
4	Checked signal or condition	Number of recognized ignition misfires (recognition via engine smooth running evaluation)
5	Threshold values	A. > approx. 20 misfires within 1000 engine revolutions B. > approx. 6 misfires within 200 engine revolutions (map dependent from engine rpm and load)
6	Prerequisite for test	– Engine speed approx. 500 – 4000 rpm – Load change < 100% per second – Engine was started at least 5 seconds previously – No ESP control function – VSS adaptation during deceleration already took place – Body acceleration sensor signal below threshold value (approx. 0.5 g) – No fault signal from camshaft Hall-effect sensor – No transmission range change – No deceleration shut-off
7	Note	If the threshold value for misfire "TWC damaging" is exceeded, the CHECK ENGINE MIL blinks immediately. If too many misfires occur on one cylinder, this cylinder is turned off (cylinder selective fuel shut-off). After turning off effected cylinders the CHECK ENGINE MIL changes from blinking to continuous activation after the next engine start. If ignition misfires are recognized with a low fuel tank level (fuel reserve indicator lamp ON) the DTC P0462 is indicated. Combustion misfires caused by lack of fuel are recognized via this additional information.

Diagnosis – Trouble Code Description

⩾ 12		Knock sensor (A16)
1	OBD trouble code	P0325 Right KS 1 (A16g1) P0330 Left KS 2 (A16g2)
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Continuously
4	Checked signal or condition	Knock sensor signal (in engine control module (ME-SFI) calculated comparison value)
5	Lower threshold value Upper threshold value	Approx. 0.19 V Approx. 4.98 V
6	Prerequisite for test	– Engine at operating temperature – Engine speed > 3600 rpm – Load > 40% – Knock control not activated
7	Note	The safety retard adjustment occurs on all cylinders in case of a fault.

Diagnosis – Trouble Code Description

⩾ 13		CKP sensor (L5)
1	OBD trouble code	P0335
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Continuously
4	Checked signal or condition	CKP sensor signal (counting of teeth on flywheel)
5	Lower threshold value Upper threshold value Test duration	(60 – 2 teeth) – 1 tooth (60 – 2 teeth) + 1 tooth < 5 seconds

Diagnosis – Trouble Code Description

⩾ 14		**Camshaft Hall-effect sensor (B6/1)**
1	OBD trouble code	P0341
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Continuously
4	Checked signal or condition	Camshaft Hall-effect sensor signal
5	Plausibility No signal Number	 The signal must change within 2 engine revolutions from 0 – 1 to 1 – 0 Maximum 1 signal change per engine revolution
6	Prerequisite for test	– Engine revolutions 25 – 6300 rpm – No CKP sensor fault

Diagnosis – Trouble Code Description

⩾ 15		AIR system malfunction (logic chain)
1	OBD trouble code	P0410
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Once per trip
4	Checked signal or condition	O_2 sensor signal before TWC
5	Threshold value Test duration	Lambda control factor approx. + 25% ("rich" stop) < 15 seconds
6	Prerequisite for test	– Engine at CTP (idle) – Vehicle standing still – AIR pump activated at least once after starting engine – No fault for voltage supply of purge switchover valve, AIR pump switchover valve and electrical AIR pump or electromagnetic AIR pump clutch – No fault in purge system – No fault of EA/CC/ISC actuator – No combustion misfire – No fault of O_2 sensor before TWC aging – No fault in CAN data bus – Self-adaptation of fuel mixture not at threshold value – Atmospheric pressure above approx. 780 mbar (e.g. no test is performed above approx. 2500 m altitude) – Engine coolant temperature < approx. 90°C – Lambda control released
7	Note	If a prerequisite changes during the test, the test is canceled and started later again.
8	Test sequence	With the start of the logic chain all functions for the automatic mixture adaptation are blocked, the purge switchover valve is closed and the actual lambda control factor is recorded.Subsequently AIR injection takes place. The mixture must become leaner. Correspondingly the lambda control factor reacts with an increase of approx. + 25%.

Diagnosis – Trouble Code Description

≫ 16		TWC efficiency below threshold
1	OBD trouble code	P0422 Right P0432 Left
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Continuously
4	Checked signal or condition	Voltage ratio (amplitudes) O_2 sensor signal after TWC to O_2 sensor signal before TWC
5	Threshold value Test duration	O_2 sensor signal after TWC maximum 50% of O_2 sensor signal before TWC (at more than 2 of 9 measurements) Approx. 210 seconds
6	Prerequisite for test	– Engine speed approx. 900 – 2000 rpm – Load approx. 10% to 45% – TWC temperature > approx. 350 °C – Lambda control released and lambda > 0.4 – No fault in O_2 sensors (signal, heater, aging) – No combustion misfire
7	Note	The TWC is evaluated via its oxygen storage capability. Within the specified engine speed and load range several measurements must take place.The results are compared with a map and if necessary a fault is recognized. The amplitude of the O_2 sensor voltage after TWC can be at the most half as large as the amplitude of the O_2 sensor voltage before TWC (Note: If, for example, no monolith would be installed in the TWC, the O_2 sensor signals before and after the TWC would be identical). If the DTCs for the catalyst and the O_2 sensor before TWC are displayed simultaneously, replace the O_2 sensor before TWC first. If subsequently no TWC fault is displayed any more, the effectiveness of the TWC is slightly reduced but it does not have to be replaced at this time.

Diagnosis – Trouble Code Description

⩾ 17		EVAP system (logic chain) Model 140/210 only, Model 129 as of 09/97
1	OBD trouble code	P0440 leaking P0442 small leak P0455 large leak
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Once per trip
4	Checked signal or condition	Fuel tank pressure sensor pressure values
5	Large leak test Small leak test Test duration	A vacuum buildup of 0.3 mbar per second can not be obtained. With the system closed, the vacuum loss is larger than approx. 15% of the vacuum obtained at the large leak test. < 30 seconds
6	Prerequisite for test	– Engine at CTP (idle) – Vehicle standing still – The time purge system is inoperative after starting engine has elapsed (approx. 16 minutes) – Lambda control released – Air injection not active – Atmospheric pressure above approx. 780 mbar (e.g. no test is performed above approx. 2500 m altitude) – Charcoal canister only slightly saturated – Lambda reading during the test > approx. 0.9 – With the fuel reserve indicator lamp ON or full tank only the large leak test takes place – Severe sloshing of fuel in the tank (inadmissible pressure fluctuations), the fuel tank pressure sensor (B4/3) recognizes it and interrupts the test – No fault at activated charcoal canister shut-off valve – No fault at fuel tank pressure sensor
7	Note	With defective fuel tank pressure sensor, DTC P0455 is displayed

Diagnosis – Trouble Code Description

≫ 18		EVAP not functioning
1	OBD trouble code	P0441
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Once per trip
4	Checked signal or condition	Pressure variations in line from charcoal canister to purge control valve
5	Fault Test duration	Pressure deviation difference less than approx. 50 mbar < 15 seconds
6	Prerequisite for test	– Engine at CTP (idle) – Load approx. 10 – 25% – Activation of purge control valve with an on-off ratio between approx. 5 – 25%

Diagnosis – Trouble Code Description

⩾ 19		Purge control valve
1	OBD trouble code	P0443
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Once per trip
4	Checked signal or condition	Voltage and current at purge control valve
5	Threshold values Short circuit to ground Short circuit to approx. + 12 V Open circuit	 Voltage < 4 V Current > approx. 4.2 A No voltage (approx. 4 V – 8 V)

Diagnosis – Trouble Code Description

≫ 20		**A. Charcoal canister shut-off valve, output stage** **B. Charcoal canister shut-off valve Model 140/210 only, Model 129 as of 09/97**
1	OBD trouble code	P0446
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Once per trip
4	Checked signal or condition	Voltage supply at charcoal canister shut-off valve and fuel tank pressure
5	Voltage supply threshold values Short circuit to ground Short circuit to approx. + 12 V Open circuit Fuel tank pressure Test duration	 Voltage < 4 V Current > approx. 4.2 A No voltage (approx. 4 V – 8 V) > approx. 3.5 mbar < 10 seconds
6	Note	With closed charcoal canister shut-off valve at least approx. 3.5 mbar vacuum must be registered by the fuel tank pressure sensor.

Diagnosis – Trouble Code Description

≫ 21		**Fuel tank pressure sensor (B4/3) Model 140/210 only, Model 129 as of 09/97**
1	OBD trouble code	P0450
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Once per trip
4	Checked signal or condition	Fuel tank pressure sensor (B4/3) signal
5	**A.** Upper threshold value Lower threshold value Test duration	 > approx. 4.7 V (corresponds to approx. 35 mbar pressure) < approx. 0.1 V (corresponds to approx. 60 mbar vacuum) 10 seconds
6	Prerequisite for test	– The time purge system is inoperative after starting engine has elapsed (approx. 10 seconds)
7	Note	Map for fuel tank pressure sensor (B4/3): – 50 mbar approx. 0.5 V; 0 mbar approx. 3.0 V; + 30 mbar approx. 4.5 V
8	**B.** Lower threshold value Upper threshold value Test duration	 approx. 0.27 V approx. 4.9 V < 5 seconds

Diagnosis – Trouble Code Description

≫ 22		Purge monitoring pressure sensor (B4/4) Model 129 only, up to 08/97
1	OBD trouble code	P0450
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Once per trip
4	Checked signal or condition	Purge monitoring pressure sensor (B4/4) signal
5	**A.** Upper threshold value Lower threshold value Test duration	 > approx. 4.7 V (corresponds to approx. 35 mbar pressure) < approx. 0.1 V (corresponds to approx. 60 mbar vacuum) 10 seconds
6	Prerequisite for test	– The time purge system is inoperative after starting engine has elapsed (approx. 10 seconds)
7	**B.** Lower threshold value Upper threshold value Test duration	 approx. 0.27 V approx. 4.9 V < 5 seconds

Diagnosis – Trouble Code Description

≫ 23		**A. VSS left front** **B. VSS left rear**
1	OBD trouble code	P0500
2	Storage of DTC and activation of CHECK ENGINE MIL	Storage of DTC after two consecutive trips with fault No activation of CHECK ENGINE MIL
3	Monitoring time and frequency of test	Continuously
4	Checked signal or condition	A. VSS left front B. VSS left rear
5	Threshold value Test duration Plausibility Test duration	The VSS (digital signal from ESP control module) must be recognized as of approx. 12 km/h < 5 seconds As of approx. 40 km/h is valid: Speed front minus speed rear < ± 30 km/h < 30 seconds
6	Prerequisite for test	– Engine speed approx. 2500 – 4500 rpm – Loag > approx. 40% – Transmission range D
7	Note	The wheel revolutions are registered and evaluated by the ESP control module. The engine control module (ME-SFI) receives a processed digital speed signal. After DTC recognition (e.g. driving on a dynamometer) the DTC memory of the ME and ESP control modules must be read.

Diagnosis – Trouble Code Description

≫ 24		Idle speed control system
1	OBD trouble code	P0507
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Continuously
4	Checked signal or condition	Engine rpm
5	Upper threshold value Lower threshold value Test duration	Nominal value + 300 rpm Nominal value – 250 rpm < 30 seconds If the actuation of the actuator motor in the EA/CC/ISC actuator is changed by the engine control module the new nominal value must be obtained within approx. 25 seconds.
6	Prerequisite for test	– Engine temperature > approx. 20 °C – Automatic A/C OFF – Vehicle standing still

Diagnosis – Trouble Code Description

≫ 25		**Voltage supply to engine control module (N3/10)**
1	OBD trouble code	P0560
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Continuously
4	Checked signal or condition	Battery voltage
5	Lower threshold value Upper threshold value Test duration	approx. 8 V approx. 17.5 V < 5 seconds
6	Prerequisite for test	– Waiting time of approx. 180 seconds after starting engine elapsed

Diagnosis – Trouble Code Description

≫ 26		**CAN bus interrupted**
1	OBD trouble code	P0600 CAN from ESP control module P1747 CAN from ETC control module
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Continuously
4	Checked signal or condition	CAN communications
5	Note Test duration	The data exchange between the control modules is monitored via the CAN element in the engine control module (ME-SFI). < 15 seconds

Diagnosis – Trouble Code Description

≫ 27		Transmission range implausible or transmission slips
1	OBD trouble code	P0700
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Continuously
4	Checked signal or condition	Calculated transmission ratios outside tolerance
5	Permissible ratios Test duration	1.986 – 2.389 2nd gear 1.355 – 1.455 3rd gear 0.970 – 1.030 4th gear 0.476 – 0.536 5th gear (calculated value) 1.726 – 2.126 reverse gear < 2 seconds
6	Prerequisite for test	– Engine speed > 400 rpm – Output shaft speed > 150 rpm (> approx. 20 km/h) – No gear change
7	Test sequence	If no gear change occurs, the ETC control module recognizes the engaged driving range on the gear ratio. If the gear ratio is outside the tolerance or the driving range is implausible the modulating pressure is adjusted to its highest value after approx. 0.5 seconds. Remains the gear ratio outside the tolerance or the driving range implausible a fault is recognized after approx. 1 second.
8	Note	The gear ratios are calculated from the following values: rpm signal n2, rpm signal n3 and output shaft rpm (via rear wheel rpm). Faults are recognized by the ETC control module and transmitted via the CAN data bus to the engine control module. Fault storage and activation of the CHECK ENGINE MIL is accomplished by the engine control module. Additionally read ETC control module DTC memory, see Diagnostic Manual , Chassis and Drivetrain (Failure code 051).

Diagnosis – Trouble Code Description

≫ 28		Command valve binds in pressure position
1	OBD trouble code	P0700
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Continuously
4	Checked signal or condition	Calculated transmission ratios outside tolerance
5	Permissible ratios Test duration	1.986 – 2.389 2nd gear 1.355 – 1.455 3rd gear 0.970 – 1.030 4th gear 0.476 – 0.536 5th gear (calculated value) 1.726 – 2.126 reverse gear < 2 seconds
6	Prerequisite for test	– Engine speed > 400 rpm – Output shaft speed > 150 rpm (> approx. 20 km/h)
7	Test sequence	After each gear change process the shift pressure is slowly reduced. If shift components slip during pressure reduction, the command valve binds in the pressure position. Slipping shift components are recognized on the respective transmission ratio.
8	Note	The gear ratios are calculated from the following values: rpm signal n2, rpm signal n3 and output shaft rpm (via rear wheel rpm). Faults are recognized by the ETC control module and transmitted via the CAN data bus to the engine control module. Fault storage and activation of the CHECK ENGINE MIL is accomplished by the engine control module. Additionally read ETC control module DTC memory, see Diagnostic Manual , Chassis and Drivetrain (Failure code 052)

Diagnosis – Trouble Code Description

≫ 29		ETC control module
1	OBD trouble code	P0702
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Continuously
4	Checked signal or condition	Failure in ETC control module – CAN communication – Impermissible version coding – Internal memory (RAM, ROM, EEPROM)
5	Note	Faults are recognized by the ETC control module and transmitted via the CAN data bus to the engine control module. Fault storage and activation of the CHECK ENGINE MIL is accomplished by the engine control module. Additionally read ETC control module DTC memory, see Diagnostic Manual , Chassis and Drivetrain (Failure code 056, 058, 059, 062, 063, 064)

Diagnosis – Trouble Code Description

≫ 30		Voltage supply to transmission solenoid valves
1	OBD trouble code	P0702
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Continuously
4	Checked signal or condition	Voltage supply to transmission solenoid valves
5	Lower threshold value Upper threshold value	< battery voltage – 2 V (longer than approx. 0.1 seconds) > battery voltage + 2 V (longer than approx. 0.1 seconds)
6	Test sequence	The solenoid valves are supplied with battery voltage by the ETC control module. The difference between battery voltage and supply voltage to the solenoid valves is monitored by the ETC control module.
7	Note	Faults are recognized by the ETC control module and transmitted via the CAN data bus to the engine control module. Fault storage and activation of the CHECK ENGINE MIL is accomplished by the engine control module. Additionally read ETC control module DTC memory, see Diagnostic Manual , Chassis and Drivetrain (Failure code 010).

Diagnosis – Trouble Code Description

≫ 31		Voltage supply and function of RPM sensors
1	OBD trouble code	P0715
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Continuously
4	Checked signal or condition	– voltage supply for RPM sensors – RPM signal n2 – RPM signal n3
5	Voltage supply for RPM sensors Lower threshold value Upper threshold value RPM signal n2, n3 Test duration	 < approx. 4.8 V > approx. 7.2 V Signals recognized and plausible < 1 second
6	Prerequisite for test RPM signal n2 Prerequisite for test RPM signal n3	– Engine speed > 450 rpm – Right rear wheel revolutions > 250 rpm – Left rear wheel revolutions > 250 rpm – 3rd or 4th gear recognized – Output shaft revolutions > 150 rpm (> approx. 20 km/h) – No transmission range change
7	Test sequence	Starting at a certain engine and wheel rpm the RPM signals must be recognized. For the RPM signal n3 the 3rd or 4th gear must be engaged additionally.
8	Note	Faults are recognized by the ETC control module and transmitted via the CAN data bus to the engine control module. Fault storage and activation of the CHECK ENGINE MIL is accomplished by the engine control module. Additionally read ETC control module DTC memory, see Diagnostic Manual , Chassis and Drivetrain (Failure code 011, 012, 013).

Diagnosis – Trouble Code Description

≫ 32		**Fault recognition CAN: Left rear and right rear wheel rpm (from ESP) implausible or communication interrupted**
1	OBD trouble code	P0720
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Continuously
4	Checked signal or condition Test duration	The ETC control module monitors the wheel rpm signal from the EPS control module via CAN data bus for plausibility. < 1 second
5	Note	Faults are recognized by the ETC control module and transmitted via the CAN data bus to the engine control module. Fault storage and activation of the CHECK ENGINE MIL is accomplished by the engine control module. Additionally read ETC control module DTC memory, see Diagnostic Manual , Chassis and Drivetrain (Failure code 022, 023, 030).

Diagnosis – Trouble Code Description

≫ 33		Transmission range comparison (repeatedly) negative
1	OBD trouble code	P0730
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Continuously
4	Checked signal or condition	Comparison of recognized gear and engaged gear (calculated gear ratio) at least 6x negative.
5	Prerequisite for test	– 2nd, 3rd, 4th or 5th gear recognized – Engine speed > 400 rpm – Output shaft revolutions > 150 rpm – No transmission range change
6	Note	The gear ratios are calculated from the following values: rpm signal n2, rpm signal n3 and output shaft rpm (via rear wheel rpm). Faults are recognized by the ETC control module and transmitted via the CAN data bus to the engine control module. Fault storage and activation of the CHECK ENGINE MIL is accomplished by the engine control module. Additionally read ETC control module DTC memory, see Diagnostic Manual , Chassis and Drivetrain (Failure code 055)

Diagnosis – Trouble Code Description

≫ 34		Torque converter lock-up clutch
1	OBD trouble code	P0740
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Continuously
4	Checked signal or condition	Friction coefficient of torque converter lock-up clutch
5	Test sequence	With the torque converter lock-up clutch engaged the friction coefficient is calculated via rpm comparisons. If it is several times out of tolerance a fault is recognized.
6	Note	Faults are recognized by the ETC control module and transmitted via the CAN data bus to the engine control module. Fault storage and activation of the CHECK ENGINE MIL is accomplished by the engine control module. Additionally read ETC control module DTC memory, see Diagnostic Manual , Chassis and Drivetrain (Failure code 053).

Diagnosis – Trouble Code Description

≫ 35		PWM solenoid valve, torque converter lock-up
1	OBD trouble code	P0743
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Continuously
4	Checked signal or condition	On-off ratio for activation of PWM solenoid valve
5	Lower threshold value Upper threshold value Test duration	< 5% >94% < 1 second
6	Note	Faults (open and short circuits) are recognized by the ETC control module and transmitted via the CAN data bus to the engine control module. Fault storage and activation of the CHECK ENGINE MIL is accomplished by the engine control module. Additionally read ETC control module DTC memory, see Diagnostic Manual , Chassis and Drivetrain (Failure code 005).

Diagnosis – Trouble Code Description

≫ 36		Modulating pressure regulating solenoid valve
1	OBD trouble code	P0748
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Continuously
4	Checked signal or condition	Activation of modulating pressure regulating solenoid valve
5	Threshold values Short circuit to ground Lower threshold value, voltage Upper threshold value, voltage Lower threshold value, current Upper threshold value, current Test duration	 < 0.4 V approx. 8.5 V approx. 15 V approx. 0.300 A approx. 0.700 A < 1 second
6	Note	Faults (activation, open and short circuits, short circuit in valve) are recognized by the ETC control module and transmitted via the CAN data bus to the engine control module. Fault storage and activation of the CHECK ENGINE MIL is accomplished by the engine control module. Additionally read ETC control module DTC memory, see Diagnostic Manual , Chassis and Drivetrain (Failure code 006).

Diagnosis – Trouble Code Description

≫ 37		Shift pressure regulating solenoid valve
1	OBD trouble code	P0748
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Continuously
4	Checked signal or condition	Activation of shift pressure regulating solenoid valve
5	Threshold values Short circuit to ground Lower threshold value, voltage Upper threshold value, voltage Lower threshold value, current Upper threshold value, current Test duration	 < 0.4 V approx. 8.5 V approx. 15 V approx. 0.300 A approx. 0.700 A < 1 second
6	Note	Faults (activation, open and short circuits, short circuit in valve) are recognized by the ETC control module and transmitted via the CAN data bus to the engine control module. Fault storage and activation of the CHECK ENGINE MIL is accomplished by the engine control module. Additionally read ETC control module DTC memory, see Diagnostic Manual , Chassis and Drivetrain (Failure code 007).

Diagnosis – Trouble Code Description

≫ 38		1-2/4-5 shift solenoid valve
1	OBD trouble code	P0753
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Continuously
4	Checked signal or condition	Voltage supply
5	Threshold values Lower threshold value, voltage Upper threshold value, voltage Test duration	 approx. 8.5 V approx. 15 V < 1 second
6	Note	Faults (activation, open and short circuits, short circuit in valve) are recognized by the ETC control module and transmitted via the CAN data bus to the engine control module. Fault storage and activation of the CHECK ENGINE MIL is accomplished by the engine control module. Additionally read ETC control module DTC memory, see Diagnostic Manual , Chassis and Drivetrain (Failure code 002).

Diagnosis – Trouble Code Description

≫ 39		2-3 shift solenoid valve
1	OBD trouble code	P0758
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Continuously
4	Checked signal or condition	Voltage supply
5	Threshold values Lower threshold value, voltage Upper threshold value, voltage Test duration	 approx. 8.5 V approx. 15 V < 1 second
6	Note	Faults (activation, open and short circuits, short circuit in valve) are recognized by the ETC control module and transmitted via the CAN data bus to the engine control module. Fault storage and activation of the CHECK ENGINE MIL is accomplished by the engine control module. Additionally read ETC control module DTC memory, see Diagnostic Manual , Chassis and Drivetrain (Failure code 003).

Diagnosis – Trouble Code Description

≫ 40		3-4 shift solenoid valve
1	OBD trouble code	P0763
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Continuously
4	Checked signal or condition	Voltage supply
5	Threshold values Lower threshold value, voltage Upper threshold value, voltage Test duration	 approx. 8.5 V approx. 15 V < 1 second
6	Note	Faults (activation, open and short circuits, short circuit in valve) are recognized by the ETC control module and transmitted via the CAN data bus to the engine control module. Fault storage and activation of the CHECK ENGINE MIL is accomplished by the engine control module. Additionally read ETC control module DTC memory, see Diagnostic Manual , Chassis and Drivetrain (Failure code 004).

Diagnosis – Trouble Code Description

≫ 41		**Knock sensor control in engine control module (N3/10) hardware failure**
1	OBD trouble code	P1386
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Each time the knock sensor control is turned off
4	Checked signal or condition	Internal hardware test of knock sensor control
5	Prerequisite for test	– Engine at operating temperature – Load diminishes (knock sensor control shut-off)
6	Note	Failure must occur at least 10x

Diagnosis – Trouble Code Description

≫ 42		AIR injection
1	OBD trouble code	P1420 AIR pump switchover valve (Y32) P1453 AIR relay module (K17)
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Continuously
4	Checked signal or condition	The voltage supply of the AIR relay module (K17) and AIR pump switchover valve (Y32) is evaluated via a current measurement in the respective end stage.
5	Lower threshold value Upper threshold value	approx. 3 V approx. 9 V
6	Prerequisite for test	– AIR injection operating

Diagnosis – Trouble Code Description

≫ 43		**Adjustable camshaft timing solenoid (logic chain)**
1	OBD trouble code	P1519 Right cylinder bank P1522 Left cylinder bank
2	Storage of DTC and activation of CHECK ENGINE MIL	Failure storage after two consecutive trips with fault No activation of CHECK ENGINE MIL
3	Monitoring time and frequency of test	Once per trip
4	Checked signal or condition	Intake MAP sensor signal
5	Fault Test duration	Pressure changes by less than approx. 20 mbar. < 10 seconds
6	Prerequisite for test	– Deceleration shut-off activated – Engine speed approx. 1000 – 1500 rpm – Engine at operating temperature – No fault at adjustable camshaft timing solenoid voltage supply
7	Note	If a prerequisite changes during the test, the test is interrupted and restarted later.
8	Test sequence	With the start of the logic chain the momentary intake manifold pressure is determined after approx. 1 second. Subsequently the adjustable camshaft timing solenoids are activated for approx. 2 seconds and the intake manifold pressure is further evaluated for approx. 6 seconds. A failure is recognized, if the intake manifold pressure does not change by at least approx. 20 mbar when the camshaft is adjusted from "advanced" to "retarded" or vice versa.

Diagnosis – Trouble Code Description

≫ 44		Adjustable camshaft timing solenoid
1	OBD trouble code	P1525 Right cylinder bank P1533 Left cylinder bank
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Continuously
4	Checked signal or condition	Voltage or current at respective adjustable camshaft timing solenoid
5	Threshold values Short circuit to ground Short circuit to approx. 12 V Open circuit	 Voltage < 4 V Current > approx. 4.2 A No voltage (approx. 4 V – 8 V)
6	Prerequisite for test	– Camshaft adjustment activated

Diagnosis – Trouble Code Description

≫ 45		Pedal value sensor (B37)
1	OBD trouble code	P1542
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Continuously
4	Checked signal or condition	Comparison of nominal value potentiometer 1 and 2 voltage signals
5	Difference at idle Difference at full load Plausibility Test duration	< approx. 8% < approx. 25% Comparison of nominal value potentiometer 1 and 2 voltage signals to air mass < 1 second
6	Note	For comparison multiply the nominal value potentiometer 2 voltage signal by 2, because the supply voltage is only 2.5 V instead of 5.0 V. A turning angle up to approx. 10% is defined as CTP, full load as of a turning angle as of approx. 55%. At the idle speed stop a high ohm reading is permissible for a brief period.

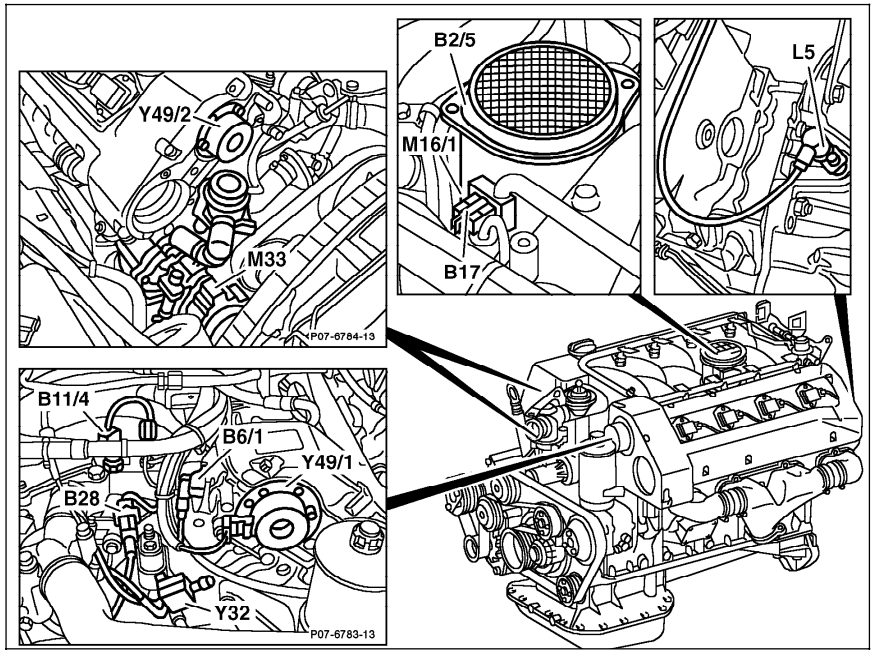
Diagnosis – Trouble Code Description

⩾ 46		**EA/CC/ISC actuator (M16/1)**
1	OBD trouble code	P1580
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Continuously
4	Checked signal or condition	Voltage comparison of actual value potentiometer 1 and actual value potentiometer 2
5	Plausibility	– Voltage difference can correspond to maximum 1° throttle valve angle – Comparison from throttle valve angle to air mass and pedal value sensor position

Diagnosis – Trouble Code Description

≫ 47		Body acceleration sensor (B24) only til 06/96
1	OBD trouble code	P1605
2	Storage of DTC and activation of CHECK ENGINE MIL	After two consecutive trips with fault
3	Monitoring time and frequency of test	Continuously
4	Checked signal or condition	Threshold values of body acceleration sensor signal
5	Lower threshold value Upper threshold value Acceleration Test duration	approx. 0.1 V approx. 4.9 V > approx. 3.4 m/s^2 < 5 seconds
6	Prerequisite for test	– Vehicle standing still – Delay time of approx. 2 seconds elapsed

Electrical Test Program – Component Locations

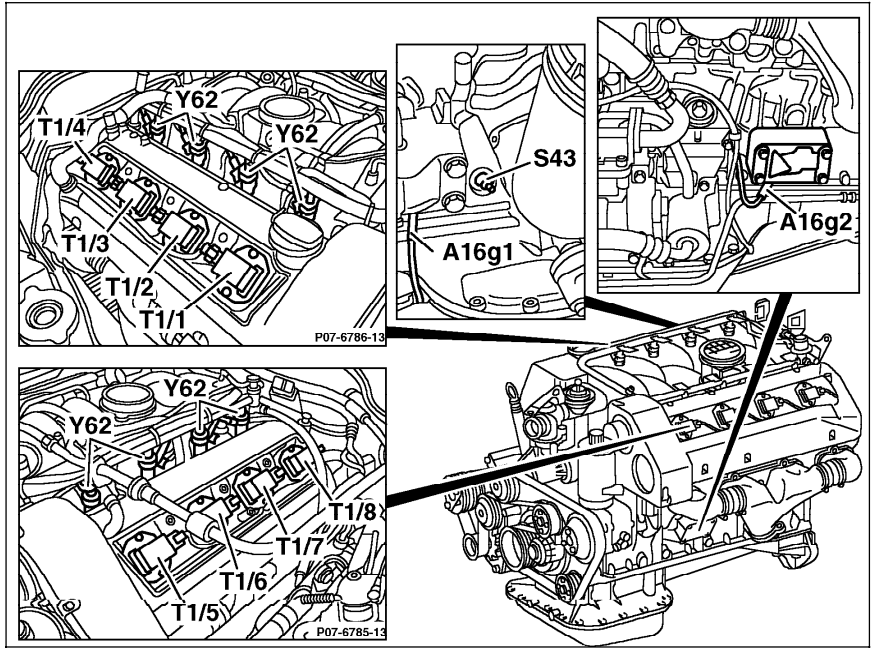


P07.51-0359-57

Figure 1

B2/5	Hot film MAF sensor
B6/1	Camshaft Hall-effect sensor
B11/4	ECT sensor
B17	IAT sensor
B28	Pressure sensor (only USA)
L5	CKP sensor
M16/1	EA/CC/ISC actuator
M33	AIR pump (only USA)
Y32	AIR pump switchover valve (only USA)
Y49/1	Left adjustable camshaft timing solenoid
Y49/2	Right adjustable camshaft timing solenoid

Electrical Test Program – Component Locations



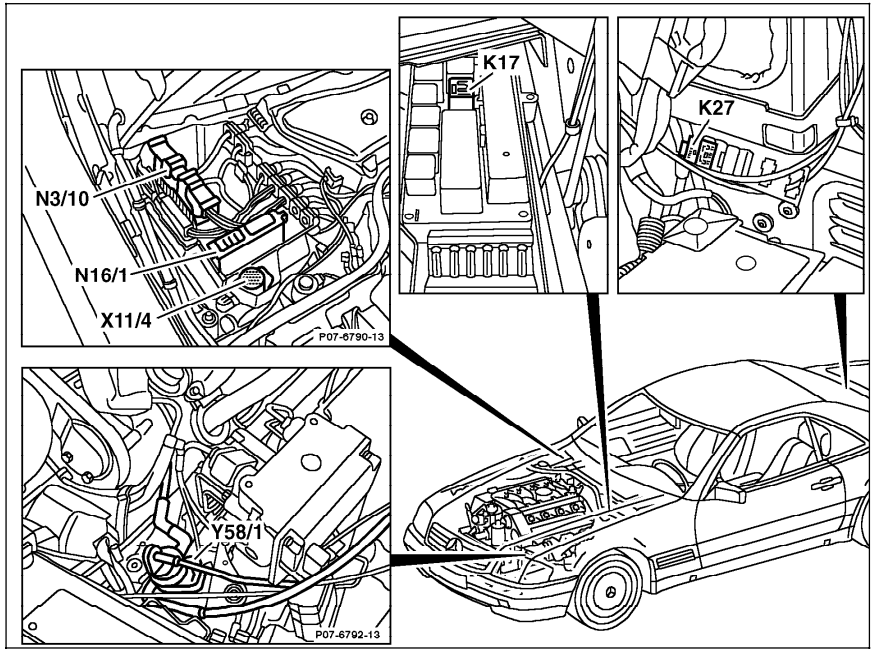
P07.51-0358-57

Figure 2

A16g1	KS 1 (right side of engine)
A16g2	KS 2 (left side of engine)
T1/1	Ignition coil 1
T1/2	Ignition coil 2
T1/3	Ignition coil 3
T1/4	Ignition coil 4
T1/5	Ignition coil 5
T1/6	Ignition coil 6
T1/7	Ignition coil 7
T1/8	Ignition coil 8
S43	Oil level switch
Y62	Injectors

Electrical Test Program – Component Locations

Engine Compartment
Model 129



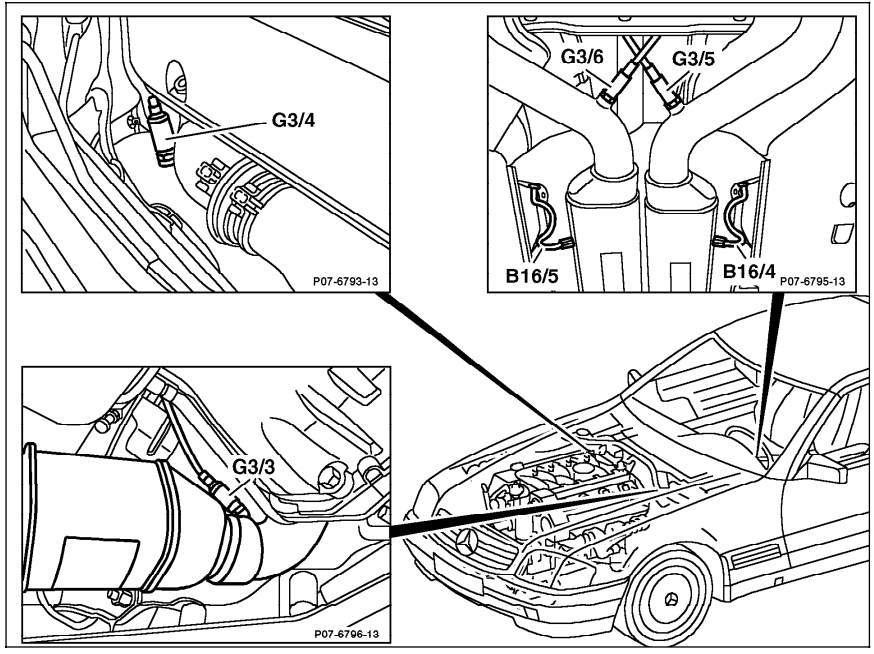
P07.51-0360-57

Figure 3

K17 AIR relay module (only USA)
K27 FP relay module
N3/10 Engine control module (ME-SFI)
N16/1 Base module (BM)
X11/4 Data link connector (DTC readout) (38-pole)
Y58/1 Purge control valve

Electrical Test Program – Component Locations

Engine Compartment
Model 129



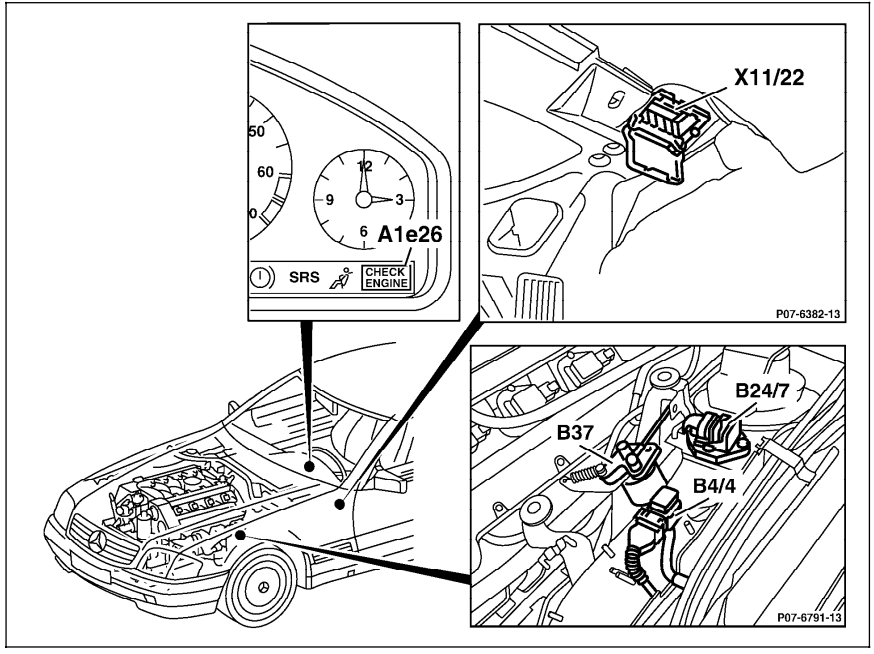
P07.51-0361-57

Figure 4

G3/3 Left O2S 1 (before TWC)
G3/4 Right O2S 1 (before TWC)
G3/5 Left O2S 2 (after TWC) (only USA)
G3/6 Right O2S 2 (after TWC) (only USA)

Electrical Test Program – Component Locations

Engine Compartment
Model 129



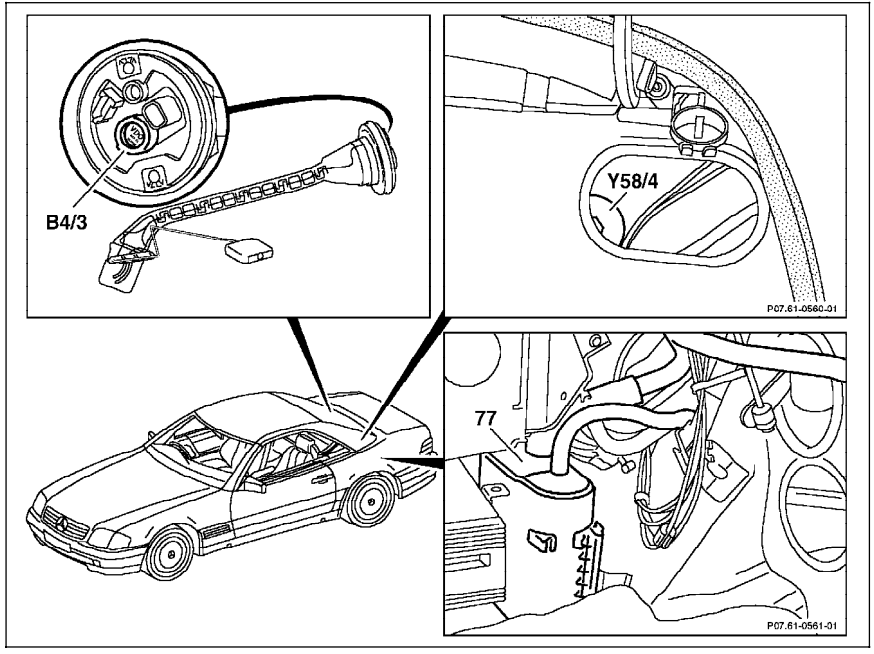
U07.51-0362-57

Figure 5

A1e26 "CHECK ENGINE" MIL (only USA)
B4/4 Purge monitoring pressure sensor (only USA, up to 08/97)
B24 Body acceleration sensor (up to 05/96)
B37 Pedal value sensor
X11/22 Diagnostic module (OBD II) generic scan tool connector (only USA)

Electrical Test Program – Component Locations

Trunk Compartment
Model 129



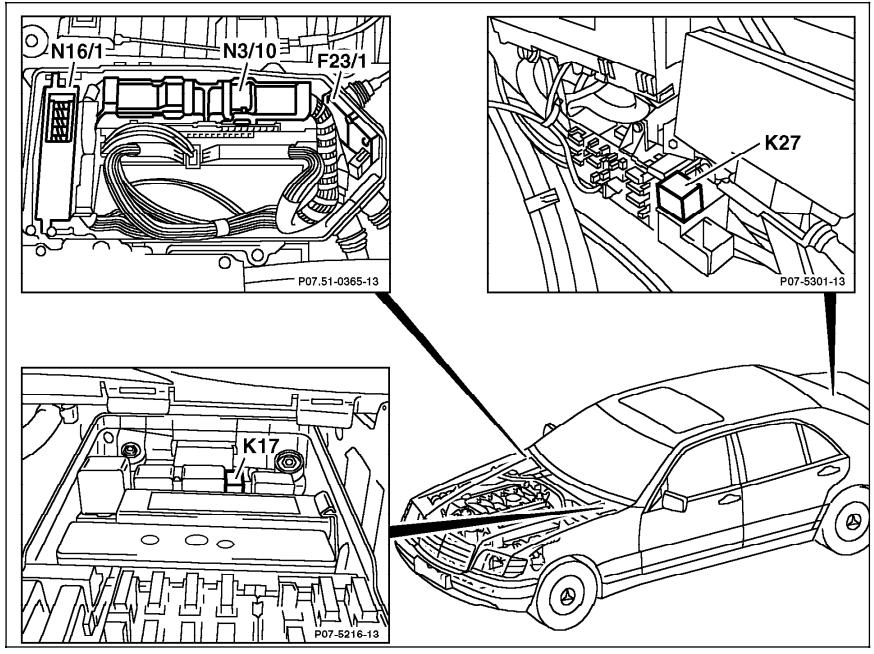
P07.61-0552-06

Figure 6

B4/3 Fuel tank pressure sensor (only USA, as of 09/97)
Y58/4 Activated charcoal canister shut-off valve (only USA, as of 09/97)
77 Activated charcoal canister

Electrical Test Program – Component Locations

Engine Compartment
Model 140



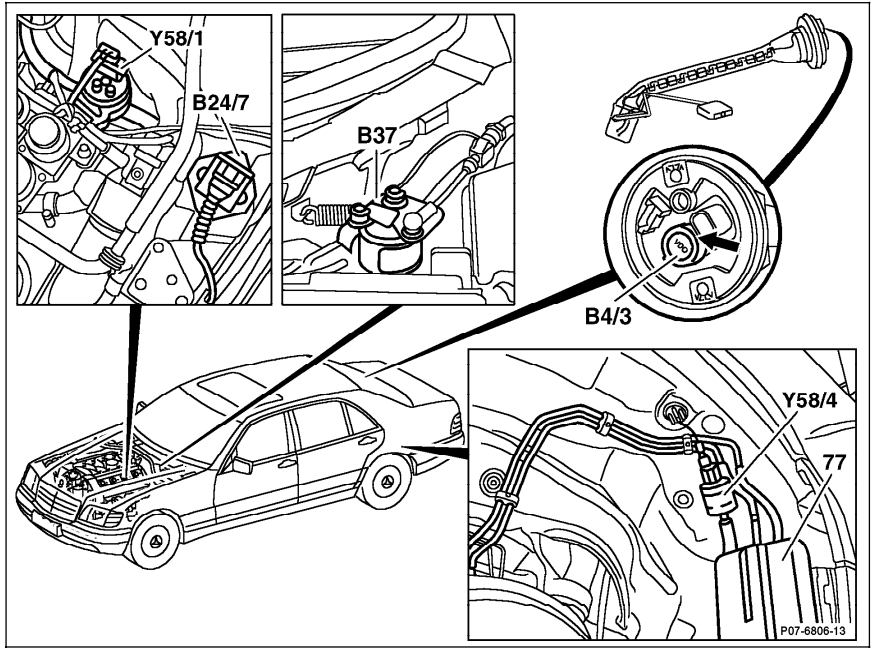
P07.51-0363-57

Figure 7

F23/1 Control module box
K17 AIR relay module (only USA, as of 12/96)
K27 FP relay module
N3/10 Engine control module (ME-SFI)
N16/1 Base module (BM)

Electrical Test Program – Component Locations

Engine Compartment
Model 140



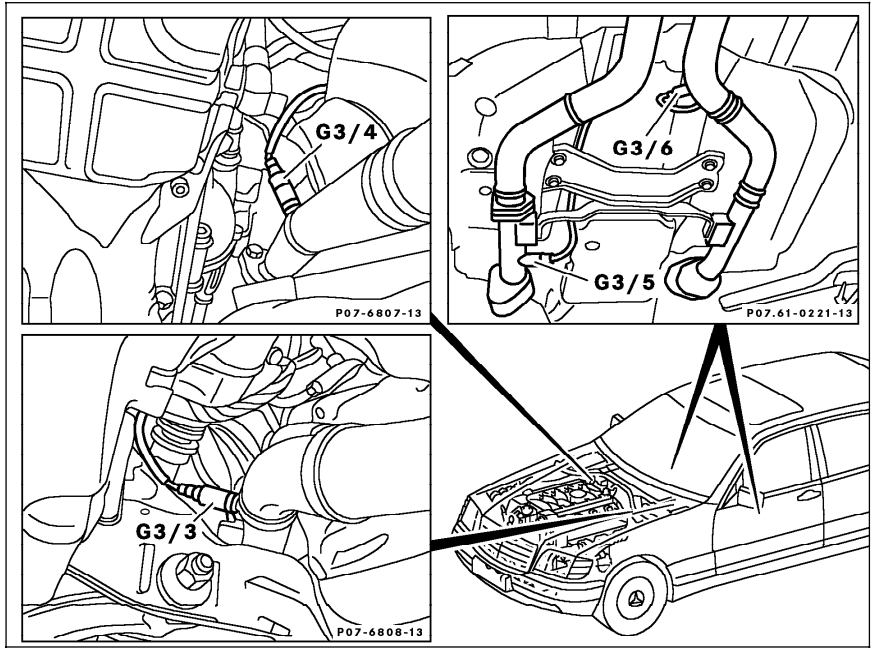
P07.61-0255-57

Figure 8

B4/3	Fuel tank pressure sensor (only USA)
B24	Body acceleration sensor (up to 05/96)
B37	Pedal value sensor
Y58/1	Purge control valve
Y58/4	Activated charcoal canister shut-off valve (only USA)
77	Active charcoal canister

Electrical Test Program – Component Locations

Engine Compartment
Model 140



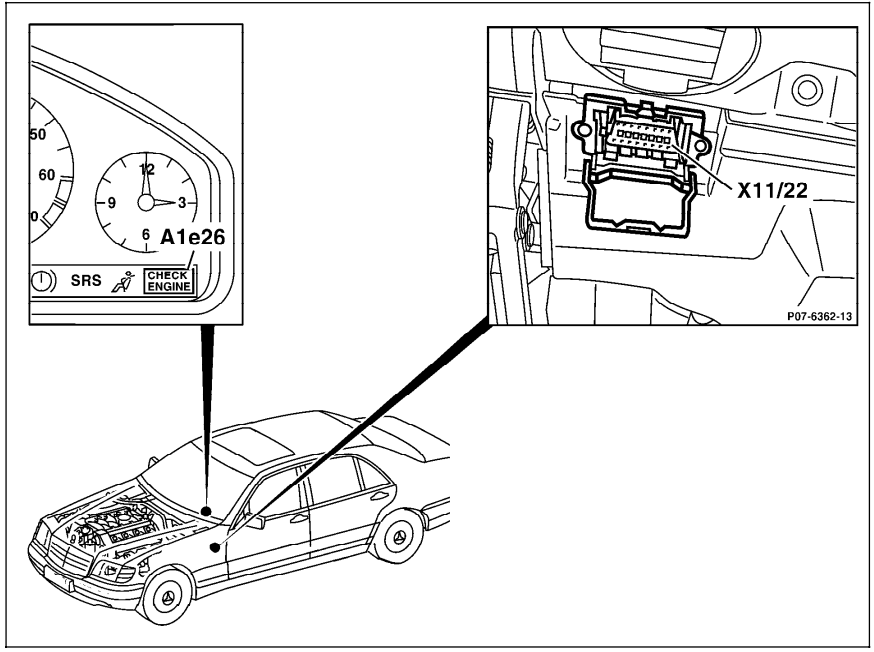
P07.61-0222-57

Figure 9

G3/3 Left O2S 1 (before TWC)
G3/4 Right O2S 1 (before TWC)
G3/5 Left O2S 2 (after TWC) (only USA)
G3/6 Right O2S 2 (after TWC) (only USA)

Electrical Test Program – Component Locations

Engine Compartment
Model 140



U07.61-0229-57

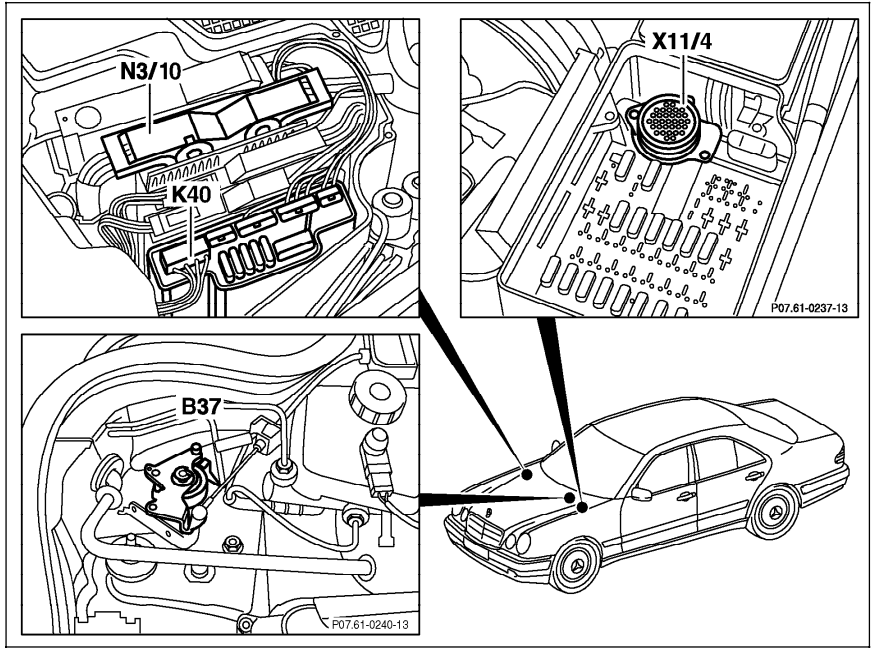
Figure 10

A1e26 "CHECK ENGINE" MIL (only USA)

X11/22 Diagnostic module (OBD II) generic scan tool connector (only USA)

Electrical Test Program – Component Locations

Engine Compartment
Model 210



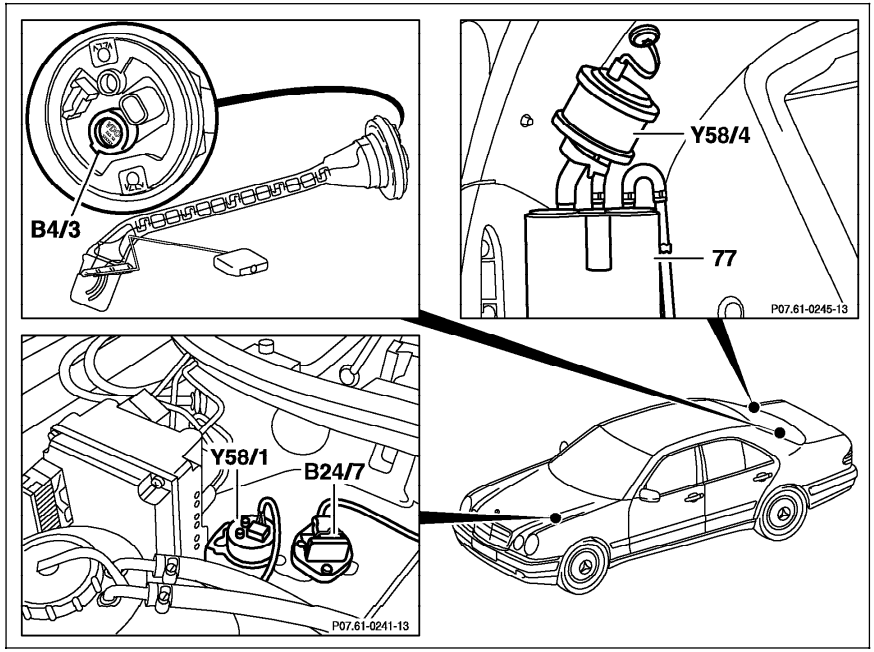
P07.61-0246-57

Figure 11

B37	Pedal value sensor
K40	Relay module with:
	AIR relay module
	FP relay module
N3/10	Engine control module (ME-SFI)
X11/4	Data link connector (DTC readout)

Electrical Test Program – Component Locations

Engine Compartment
Model 210



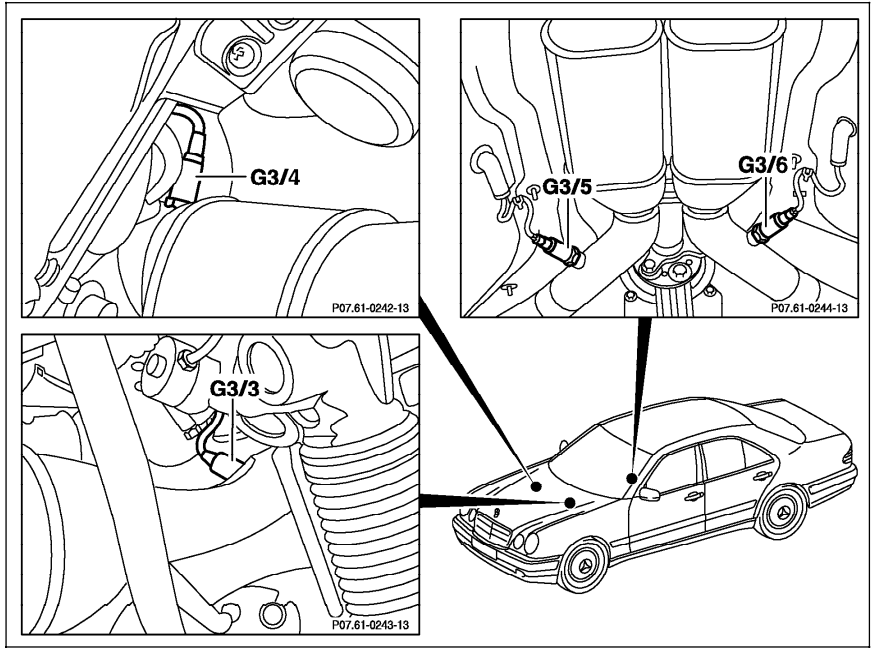
P07.61-0247-57

Figure 12

B4/3	Fuel tank pressure sensor (only USA)
B24	Body acceleration sensor (up to 05/96)
Y58/1	Purge control valve
Y58/4	Activated charcoal canister shut-off valve (only USA)
77	Activated charcoal canister

Electrical Test Program – Component Locations

Engine Compartment
Model 210



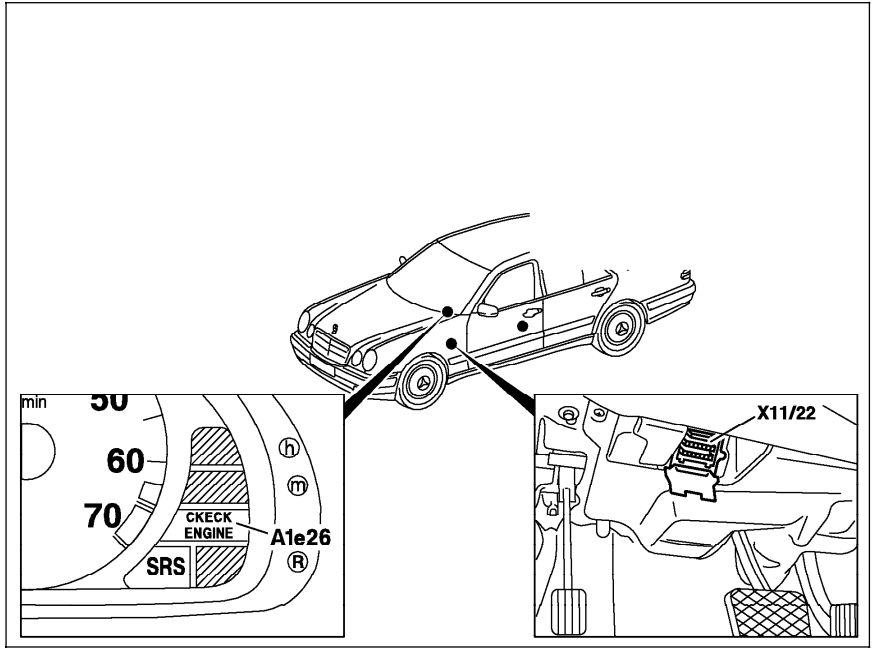
P07.61-0248-57

Figure 13

G3/3	Left O2S 1 (before TWC)
G3/4	Right O2S 1 (before TWC)
G3/5	Left O2S 2 (after TWC) (only USA)
G3/6	Right O2S 2 (after TWC) (only USA)

Electrical Test Program – Component Locations

Engine Compartment
Model 210



U07.61-0249-57

Figure 14

A1e26 CHECK ENGINE MIL (only USA)
X11/22 Diagnostic module (OBD II) generic scan tool connector

Electrical Test Program – Preparation for Test

Preliminary work:
Diagnosis - Malfunction Memory 11

1. Ignition: **OFF**
2. Connect test cable with socket box to engine control module (N3/10) according to connection diagram

⚠

Connect interior harness connector to connection 1 on test cable.
Connect engine harness connector to connection 2 on test cable.

Note:

The test program is divided into four sections:

23 SFI Test
24 Ignition System Test
25 EA System Test
26 CC System Test

Electrical wiring diagrams :
Electrical Troubleshooting Manual, Model 129,
Electrical Troubleshooting Manual, Model 140,
Electrical Troubleshooting Manual, Model 210.

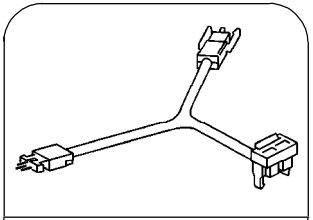
Note regarding "Test Connection" column:

The numbers indicated in parentheses, for example, ⇒ 1.0 (1.23) signify:

1= Connector 1 on wiring diagram,
23= Socket 23 on wiring diagram.

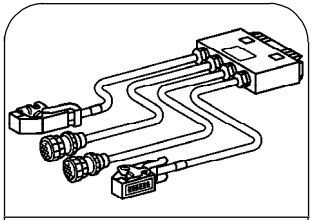
Electrical Test Program – Preparation for Test

Special Tools



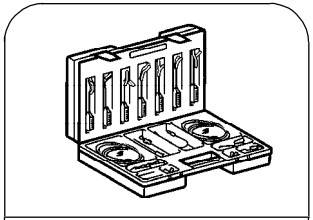
102 589 04 63 00

Test cable



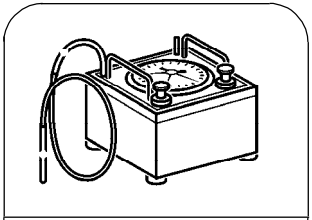
140 589 46 63 00

Test cable, 117-pin



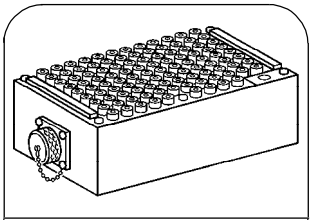
201 589 00 99 00

Electrical connecting set



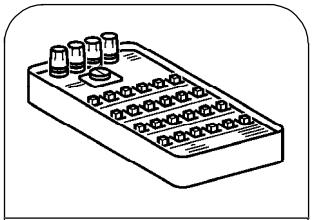
201 589 13 21 00

Tester



129 589 00 21 00

126-pin socket box



124 589 09 63 00

Ohm decade

Test Equipment; See MBUSA Standard Service Equipment Program

Description	Brand, model, etc.
Digital multimeter	Fluke models 23, 77 III, 83, 85, 87
Engine analyzer	Bear DACE Herman Electronics

Electrical Test Program – Preparation for Test

To Avoid Damage to the Ignition System

- To avoid damage to the engine control module (N3/10), connect/disconnect the control module connectors only with the ignition: **OFF**.
- Do not connect a test lamp to circuit 1 or 15 of the ignition coil.
- The high output side of the ignition system must carry at least 2 kΩ of load (spark plug connector).
- To avoid damaging the ignition coils during individual testing, do not load the coil with more than 28 kV.

⚠ **WARNING!**
High Voltage!

- Primary connections carry a voltage of up to 400 V. The iron core bracket of the ignition coils must always be connected to vehicle ground.
- Persons with pacemakers should not work on this type of ignition system.

Using Test Equipment

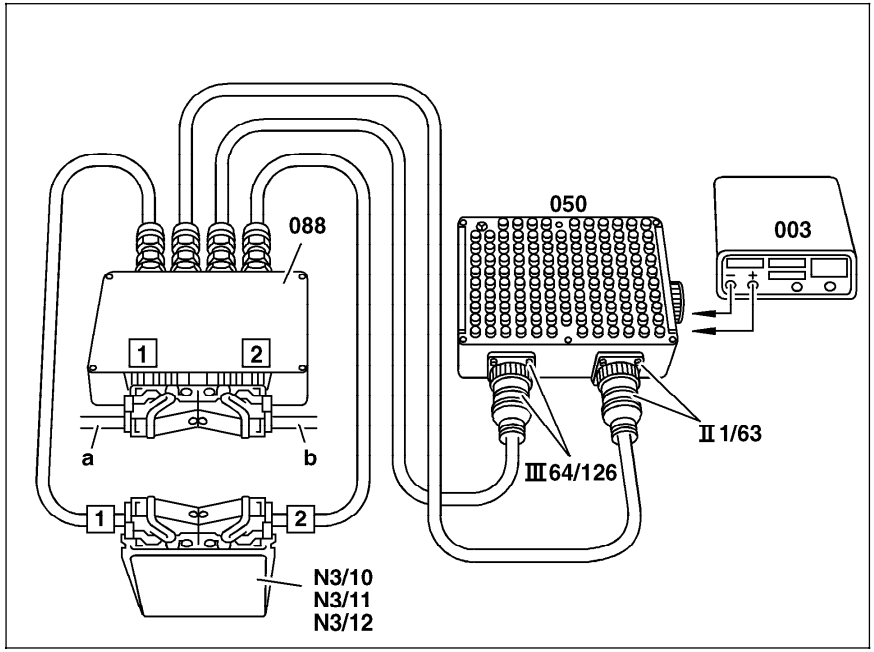
- **Ensure that the engine and ignition are OFF when connecting/ disconnecting test equipment to a coil.**

Electrical Test Program – Component Locations

Connection Diagram - Socket Box

⚠

Connect interior harness connector to connection 1 on test cable.
Connect engine harness connector to connection 2 on test cable.



P07-6817-57

Figure 1

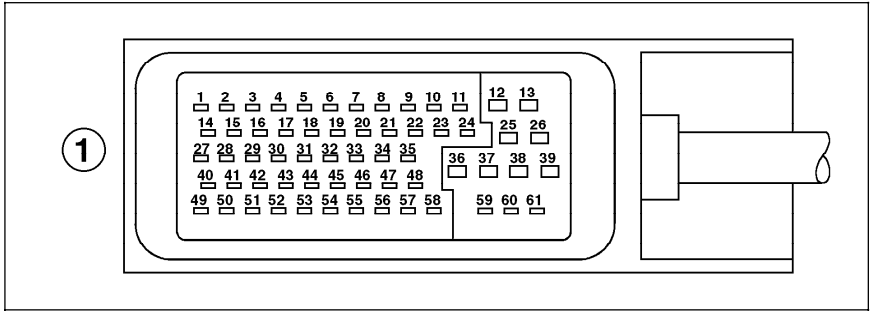
003 Digital multimeter
050 Socket box (126-pole)
088 Test cable
N3/10 Engine control module (ME-SFI)

a Interior harness
b Engine harness

Electrical Test Program – Preparation for Test

Connector Layout - Engine Control Module

Connector 1 – Interior

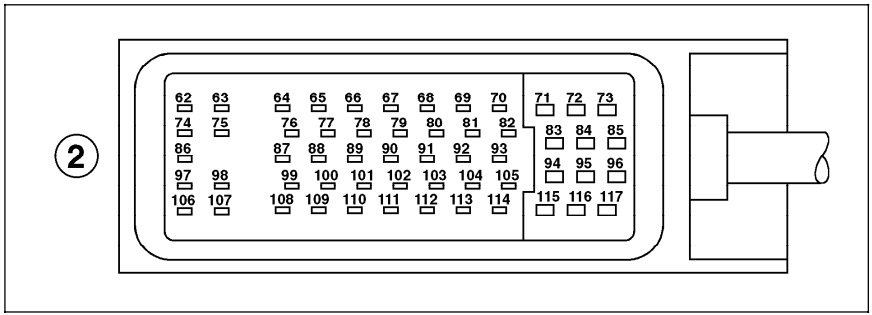


P07-6727-53

1	Stop lamp switch (S9/1) N.O. contact
2	CC switch (S40), accelerate/set
3	Stop lamp switch (S9/1) N.C. contact
4	Pedal value sensor (B37) nominal potentiometer 2 (+)
5	Pedal value sensor (B37) nominal potentiometer 2 (–)
6	Pedal value sensor (B37) nominal value potentiometer 2 (wiper)
7	–
8	A/C pushbutton control module (N22) (only til 05/96, as of 06/96 via CAN)
9	Left front axle VSS (L6/1)
10	Purge control valve (Y58/1)
11	"CHECK ENGINE" MIL (A1e26) (only til 05/96, as of 06/96 via CAN)
12	O2S 2 (after TWC) heating (G3/5) (G3/6)
13	O2S 1 (before TWC) heating (G3/3) (G3/4)
14–16	–
17	Pedal value sensor (B37) nominal value potentiometer 2 (+)
18	Pedal value sensor (B37) nominal value potentiometer 2 (–)
19	Pedal value sensor (B37) nominal value potentiometer 1 (wiper)
20	–
21	EA warning lamp (A1e39)
22	Left rear axle VSS (L6/3)
23	Tank open signal (only USA), up to 05/96, as of 06/96 via CAN)
24	FP relay module (K27), Model 129/140 Relay module K40, Model 210
25	Voltage supply, (circuit 87M), Model 129/140 from N16/1 Voltage supply, (circuit 87M), Model 210 from K40
26	Output ground (W15), right foot well
27	CC switch (S40), control contact
28	CC switch (S40), off
29	–
30	CC switch (S40), resume
31	CC switch (S40), decelerate/set
32	Oil level switch (S43)
33	Fuel reserve signal (only til 05/96, as of 06/96 via CAN)
34	Activated charcoal canister shut-off valve (Y58/4) (only USA, model 140/210, Model 129 as of 09/97)
35	Voltage supply, circuit 30, Model 129/140 from N16/1 Voltage supply, circuit 30, Model 210 from K40
36	Voltage supply, circuit 87E for EA function
37	–
38	Electronic ground (W15/1), right foot well
39	Output ground (W15), right foot well
40	O2S 1 (before TWC) ground
41	Right O2S 1 (before TWC) signal (G3/4)
42	Right O2S 2 (after TWC) signal (G3/6) (only USA)
43	*Not applicable to U.S.A. version vehicles*
44	Body acceleration sensor (B24), 5V voltage supply, Fuel tank pressure sensor, Model 140/210, Model 129 as of 09/97 (only USA) Purge monitoring pressure sensor, Model 129 up to 08/97
45–46	–
47	*Not applicable to U.S.A. version vehicles*
48	Body acceleration sensor (B24), signal (up to 05/96)
49	Left O2S 1 (before TWC) signal (G3/3)
50	Left O2S 2 (after TWC) signal (G3/5) (only USA)
51	Purge monitoring pressure sensor (B4/4) (only USA, Model 129 up to 08/97) Fuel tank pressure sensor (B4/3) (Model 140/210, Model 129 as of 09/97)
52	*Not applicable to U.S.A. version vehicles*
53	Ground, sensors
54	–
55	Diagnosis output (injection system), DLC (X11/4)
56	Diagnosis output, (engine speed) DLC (X11/4)
57	AIR relay module (K17), Model 129, 140 (only USA)
58	Instrument cluster (fuel consumption signal)
59	–
60	CAN data line "H"
61	CAN data line "L"

Electrical Test Program – Preparation for Test

Connector Layout - Engine Control Module
Connector 2 – Engine



P07-6738-53

62 - 63	–
64	IAT sensor (+) (B17)
65	Pressure sensor (B28) (only USA)
66	CMP sensor signal (L5/1)
67	Hot film MAF sensor (+) (B2/5)
68	Hot film MAF sensor (–) (B2/5)
69	Injector (Y62y3)
70	Injector (Y62y6)
71	Injector (Y62y5)
72	Injector (Y62y1)
73	Ground bridge to pin 96
74	EA/CC/ISC actuator (–) (M16/1)
75	EA/CC/ISC actuator (+) (M16/1)
76	ECT sensor (+) (B11/4)
77	–
78	CKP sensor (–) (L5)
79	Right KS 1 (+) (A16g1)
80	Right KS 1 (–) (A16g1)
81	–
82	Injector (Y62y8)
83	Ignition coil (T1/1)
84	Ignition coil (T1/5)
85	Ignition coil (T1/4)
86	–
87	Ground: IAT sensor, Intake MAP sensor, CMP sensor, ECT sensor, pressure sensor (B28) (only USA)
88	Pressure sensor (B28), 5V voltage supply (only USA)
89	CKP sensor (+) (L5)
90	Left KS 2 (+) (A16g2)
91	Left KS 2 (–) (A16g2)
92	Air relay module (K17), Model 210 (only USA)
93	Injector (Y62y4)
94	Ignition coil (T1/6)
95	Ignition coil (T1/8)
96	Ground bridge to pin 73
97	EA/CC/ISC actuator, actual value potentiometer (wiper) (M16/1r1)
98	EA/CC/ISC actuator, actual value potentiometer (–) (M16/1r1–r2)
99 - 102	–
103	Injector (Y62y7)
104-105	–
106	EA/CC/ISC actuator, actual value potentiometer (+) (M16/1r1 – r2)
107	EA/CC/ISC actuator, actual value potentiometer (wiper) (M16/1r2)
108-110	–
111	Left adjustable camshaft timing solenoid (Y49/1)
112	Injector (Y62y2)
113	Right adjustable camshaft timing solenoid (Y49/2)
114	AIR pump switchover valve (Y32) (only USA)
115	Ignition coil (T1/3)
116	Ignition coil (T1/7)
117	Ignition coil (T1/2)

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
1.0	P0 560	**Engine control module (ME-SFI) (N3/10)** Voltage supply Circuit 30	N3/10 26 (1.26) — V — 35 (1.35)	Ignition: **ON**	11 – 14 V	⇒ 1.1
1.1		Ground wire	N3/10 26 (1.26) — V — X11/4 2 39 (1.39) — V — X11/4 2	Ignition: **ON**	11 – 14 V	Wiring, **Model 129:** Ground, module box bracket (W27), **Model 140:** Output ground (W15), right footwell, **Model 210:** Electronic ground (W16/6), right component compartment, ⇒ 1.2
1.2		Voltage supply Circuit 30	X11/4 1 — V — N3/10 35 (1.35)	Ignition: **ON**	11 – 14 V	Wiring, **Model 129, 140:** Base module (N16/1) or fuse on base module, **Model 210:** Relay module (K40).

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
2.0	P0 560	**Engine control module (ME-SFI) (N3/10)** Voltage supply Circuit 87M	N3/10 38 (1.38) — V — 25 (1.25)	Ignition: **ON**	11 – 14 V	⇒ 2.1
2.1		Electronics ground	N3/10 38 (1.38) — V — X11/4 2	Ignition: **ON**	11 – 14 V	Wiring, **Model 129 and 140:** Electronic ground (W15/1), right footwell, **Model 210:** Electronic ground (W16/6), right component compartment, ⇒ 2.2
2.2		Voltage supply Circuit 87M	X11/4 1 — V — N3/10 25 (1.25)	Ignition: **ON** Ignition: **OFF**	11 – 14 V < 1 V	Wiring, **Model 129, 140:** Base module (N16/1) or fuse on base module, **Model 210:** Relay module (K40).
3.0	P0 560	**Engine control module (ME-SFI) (N3/10)** Voltage supply Circuit 87M	N3/10 39 (1.39) — V — 36 (1.36)	Ignition: **ON** Ignition: **OFF**	11 – 14 V < 1 V	Wiring, **Model 129, 140:** Base module (N16/1) or fuse on base module, **Model 210:** Relay module (K40).

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
4.0	P0 100	**Hot film MAF sensor (B2/5)** Voltage at hot film	N3/10 68 (2.68) — V — 67 (2.67)	Engine: **at Idle** Engine coolant temperature >70°C	0.7 – 1.0 V [2]	Wiring ⇒ 5.0, Air intake system leak, B2/5
5.0	P0 100	**Ground wire for hot film MAF sensor (B2/5)**	N3/10 38 (1.38) — Ω — 67 (2.67)	Ignition: **OFF** Disconnect MAF sensor (B2/5) connector. Bridge sockets 1 and 4.	< 1 Ω	Ground wire.
6.0	P0 105	**Pressure sensor (B28)** Sensor signal	N3/10 87 (2.87) — V — 65 (2.65)	Connect vacuum tester to pressure sensor (B28) using Y-fitting (Figure 1). Ignition: **ON** Engine: **at Idle**	> 3.5 V < 2 V and pressure climbs to > 500 mbar.	Vacuum line, Wiring, ⇒ 6.1 B28
6.1		Pressure sensor (B28) Voltage supply	N3/10 87 (2.87) — V — 88 (2.88)	Ignition: **ON**	4.7 – 5.3 V	N3/10

[2] Voltage increases with increasing rpm.

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
7.0		**Model 129, 140** **FP relay module (K27)** **Model 210** **Relay module (K40)** Control signal	N3/10  24 (1.24) — 25 (1.25)	Ignition: **ON** Engine: **Start**	11 – 14 V for approx. 1 sec. 11 – 14 V during cranking and while engine runs.	⇒ 7.1, N3/10
7.1		Current draw K27 or K40	N3/10  26 (1.26) — 24 (1.24)	Ignition: **ON**	0.1 – 0.3 A	Wiring, K27 or K40

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
8.0	P0 115	**ECT sensor (B11/4)** Voltage	N3/10 87 (2.87) — V — 76 (2.76)	Ignition: **ON**	°C / V 20 / 3.5 30 / 3.1 40 / 2.7 50 / 2.3 60 / 1.9 70 / 1.5 80 / 1.2 90 / 1.0 100 / 0.8 ±5 %	⇒ 8.1, N3/10
8.1		Resistance (B11/4)	N3/10 87 (2.87) — Ω — 76 (2.76)	Ignition: **OFF** Disconnect connector 2 on engine control module (N3/10).	°C / Ω 20 / 2500 30 / 1700 40 / 1170 50 / 830 60 / 600 70 / 435 80 / 325 90 / 245 100 / 185 ±5 %	Wiring, ⇒ 8.2
8.2		ECT sensor (B11/4) Resistance	B11/4 1 — Ω — 4	Disconnect connector on ECT sensor (B11/4).	Nominal value, see ⇒ 8.1	B11/4

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
9.0	P0 110	**IAT sensor (B17)** Voltage	N3/10 87 (2.87) — V — 64 (2.64)	Ignition: **ON**	°C / V 10 / 3.2 20 / 2.6 30 / 2.1 40 / 1.6 50 / 1.2 60 / 0.9 70 / 0.7 ±5 %	⇒ 9.1, N3/10
9.1		Resistance (B17)	N3/10 87 (2.87) — Ω — 64 (2.64)	Ignition: **OFF** Disconnect connector 2 on engine control module (N3/10).	°C / Ω 10 / 9670 20 / 6060 30 / 3900 40 / 2600 50 / 1760 60 / 1220 70 / 860 ±5 %	Wiring, ⇒ 9.2
9.2		IAT sensor (B17) Resistance	B17 1 — Ω — 2	Disconnect connector from IAT sensor (B17).	Nominal value, see ⇒ 9.1	B17

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
10.0		**Engine control module (N3/10)** TN-signal output	N3/10 [3] 38 (1.38) — (1.56) 56 N3/10 [4] 38 (1.38) — (1.56) 56	Engine: **Start** or Engine: **at Idle**	Signal: see Figure 2. 5 – 7.5 V	Wiring, N3/10
11.0	P0 150 P0 153	**Left O2S 1 (before TWC) (G3/3)** O2S signal	N3/10 40 (1.40) — (1.49) 49	ECT > 80 ° C, run engine at idle for at least two minutes.	fluctuates from – 0.2 V to + 1.0 V, by more than 0.3 V	Wiring, G3/3, ⇒ 13.0
12.0	P0 130 P0 133	**Right O2S 1 (before TWC) (G3/4)** O2S signal	N3/10 40 (1.40) — (1.41) 41	ECT > 80 ° C, run engine at idle for at least two minutes.	fluctuates from – 0.2 V to + 1.0 V, by more than 0.3 V	Wiring, G3/4, ⇒ 13.0
13.0	P0 135 P0 155	**Left O2S 1 (before TWC) (G3/3)** **Right O2S 1 (before TWC) (G3/4)** O2S heater control signal	N3/10 13 (1.13) — (1.25) 25	ECT > 80 ° C, run engine at idle for at least two minutes.	11 – 14 V	⇒ 13.1, N3/10

[3] Test with oscilloscope.

[4] Test with multimeter only if oscilloscope is not available.

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
13.1		O2S 1 (G3/3 and G3/4) Current draw	N3/10  26 (1.26) — 13 (1.13)	Ignition: **ON**	1.2 – 6.8 A [5]	Wiring, G3/3 or G3/4
14.0	P0 156 P0 160	**Left O2S 2** **(afterTWC) (G3/5)** O2S signal	N3/10  40 (1.40) — 50 (1.50)	ECT > 80° C, Engine: **Start** Raise and hold engine speed at 2000 – 3000 rpm for approx. three minutes until O2S 2 heater turns on (see HHT). Briefly depress accelerator pedal to WOT.	450 mV constant Voltage changes. Voltage changes by > 100 mV.	Wiring, ⇒ 16.0

[5] The current draw for one O2S is 0.6 – 3.4 A.

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
15.0	P0 136 P0 140	**Right O2S 2** **(afterTWC) (G3/6)** O2S signal	N3/10 40 (1.40) — V — 42 (1.42)	ECT > 80° C, Engine: **Start** Raise and hold engine speed at 2000 – 3000 rpm for approx. three minutes until O2S 2 heater turns on (see HHT). Briefly depress accelerator pedal to WOT.	450 mV constant Voltage changes. Voltage changes by > 100 mV.	Wiring, ⇒ 16.0
16.0	P0 141 P0 161	**Left O2S 2** **(after TWC) (G3/5)** **Right O2S 2** **(after TWC) (G3/6)** O2S heater control signal	N3/10 12 (1.12) — V — 25 (1.25)	Engine: **at Idle** ECT > 80° C, run engine at idle for at least two minutes.	11 – 14 V	⇒ 16.1, N3/10
16.1		O2S 2 (G3/5 or G3/6) Current draw	N3/10 26 (1.26) — A — 12 (1.12)	Ignition: **ON**	1.2 – 6.8 A [5]	Wiring, G3/5 or G3/6

[5] The current draw for one O2S is 0.6 – 3.4 A.

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
17.0	P0 201	**Injector (Y62y1)** Activation and injection duration	N3/10 72 (2.72) — 25 (1.25)	**ECT approx. 20° C** at start **ECT approx. 80° C** at idle accelerate briefly	Injection time: approx. 8 ms approx. 3 – 5 ms approx. 14 ms (signal see Figures 3 and 4)	⇒ 17.1, N3/10, **Further possibilities:** ECT sensor (B11/4), IAT sensor (B17), O2S 1 (G3/3 or G3/4).
17.1		Resistance (Y62y1)	N3/10 72 (2.72) — 25 (1.25)	Ignition: **OFF**	14 – 17 Ω	Wiring, Y62y1.
18.0	P0 202	**Injector (Y62y2)** Activation and injection duration	N3/10 112 (2.112) — 25 (1.25)	**ECT approx. 20° C** at start **ECT approx. 80° C** at idle accelerate briefly	Injection time: approx. 8 ms approx. 3 – 5 ms approx. 14 ms (signal see Figures 3 and 4)	⇒ 18.1, N3/10, **Further possibilities:** ECT sensor (B11/4), IAT sensor (B17), O2S 1 (G3/3 or G3/4).

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
18.1		Resistance (Y62y2)	N3/10 112 — (2.112) — Ω — 25 (1.25)	Ignition: **OFF**	14 – 17 Ω	Wiring, Y62y2
19.0	P0 203	**Injector (Y62y3)** Activation and injection duration	N3/10 69 — (2.69) — 25 (1.25)	**ECT approx. 20° C** at start **ECT approx. 80° C** at idle accelerate briefly	Injection time: approx. 8 ms approx. 3 – 5 ms approx. 14 ms (signal see Figures 3 and 4)	⇒ 19.1, N3/10, **Further possibilities:** ECT sensor (B11/4), IAT sensor (B17), O2S 1 (G3/3 or G3/4).
19.1		Resistance (Y62y3)	N3/10 69 — (2.69) — Ω — 25 (1.25)	Ignition: **OFF**	14 – 17 Ω	Wiring, Y62y3

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
20.0	P0 204	**Injector (Y62y4)** Activation and injection duration	N3/10  93 (2.93) 25 (1.25)	**ECT approx. 20° C** at start **ECT approx. 80° C** at idle accelerate briefly	Injection time: approx. 8 ms approx. 3 – 5 ms approx. 14 ms (signal: see Figures 3 and 4)	⇒ 20.1, N3/10 **Further possibilities:** ECT sensor (B11/4), IAT sensor (B17), O2S 1 (G3/3 or G3/4).
20.1		Resistance (Y62y4)	N3/10  93 (2.93) 25 (1.25)	Ignition: **OFF**	14 – 17 Ω	Wiring, Y62y4

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
21.0	P0 205	**Injector (Y62y5)** Activation and injection duration	N3/10 71 (2.71) — 25 (1.25)	**ECT approx. 20° C** at start **ECT approx. 80° C** at idle accelerate briefly	Injection time: approx. 8 ms approx. 3 – 5 ms approx. 14 ms (signal: see Figures 3 and 4)	⇒ 21.1, N3/10 **Further possibilities:** ECT sensor (B11/4), IAT sensor (B17), O2S 1 (G3/3 or G3/4).
21.1		Resistance (Y62y5)	N3/10 71 (2.71) — 25 (1.25)	Ignition: **OFF**	14 – 17 Ω	Wiring, Y62y5

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
22.0	P0 206	**Injector (Y62y6)** Activation and injection duration	N3/10 70 (2.70) — 25 (1.25)	**ECT approx. 20° C** at start **ECT approx. 80° C** at idle accelerate briefly	Injection time: approx. 8 ms approx. 3 – 5 ms approx. 14 ms (signal see Figures 3 and 4)	⇒ 22.1, N3/10, **Further possibilities:** ECT sensor (B11/4), IAT sensor (B17), O2S 1 (G3/3 or G3/4).
22.1		Resistance (Y62y6)	N3/10 70 (2.70) — 25 (1.25)	Ignition: **OFF**	14 – 17 Ω	Wiring, Y62y6

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
23.0	P0 207	**Injector (Y62y7)** Activation and injection duration	N3/10 103 (2.103) — 25 (1.25)	**ECT approx. 20° C** at start **ECT approx. 80° C** at idle accelerate briefly	Injection time: approx. 8 ms approx. 3 – 5 ms approx. 14 ms (signal see Figures 3 and 4)	⇒ 23.1, N3/10, **Further possibilities:** ECT sensor (B11/4), IAT sensor (B17), O2S 1 (G3/3 or G3/4).
23.1		Resistance (Y62y7)	N3/10 103 (2.103) — 25 (1.25)	Ignition: **OFF**	14 – 17 Ω	Wiring, Y62y7

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
24.0	P0 208	**Injector (Y62y8)** Activation and injection duration	N3/10  82 (2.82) — 25 (1.25)	**ECT approx. 20° C** at start **ECT approx. 80° C** at idle accelerate briefly	Injection time: approx. 8 ms approx. 3 – 5 ms approx. 14 ms (signal: see Figures 3 and 4)	⇒ 24.1, N3/10 **Further possibilities:** ECT sensor (B11/4), IAT sensor (B17), O2S 1 (G3/3 or G3/4).
24.1		Resistance (Y62y8)	N3/10  82 (2.82) — 25 (1.25)	Ignition: **OFF**	14 – 17 Ω	Wiring, Y62y8

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
25.0	P0 410 P1 453	**Only** (USA) **Model 129, 140** **AIR relay module (K17)** **Model 210** **Relay module (K40)** Activation	**Models 129/140** N3/10 57 — (1.57) (V) — 25 (1.25) **Model 210** N3/10 92 — (2.92) (V) — 25 (1.25)	Disconnect ECT sensor (B11/4) connector. Simulate 2.5 kΩ resistance at sockets 1 and 4 with resistance substitution unit. Engine: **at Idle**	11 – 14 V for approx. two minutes **and** AIR pump runs.	⇒ 25.1, N3/10
25.1		Model 129, 140 AIR relay module (K17) Model 210 Relay module (K40) Current draw	**Models 129/140** N3/10 38 — (1.38) (A) — 57 (1.57) **Model 210** N3/10 38 — (1.38) (A) — 92 (2.92)	Ignition: **ON**	0.1 – 0.3 A	Wiring, K17 or K40

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
26.0	P0 410 P1 420	**Only** (USA) **AIR pump switchover valve (Y32)** Activation	N3/10 114 — (2.114) (V) — 25 (1.25)	Disconnect ECT sensor (B11/4) connector. Simulate 2.5 kΩ resistance at sockets 1 and 4 with resistance substitution unit. Engine: **at Idle**	11 – 14 V for approx. two minutes **and** AIR pump runs.	N3/10
26.1		Current draw (Y32)	N3/10 38 — (1.38) (A) — 114 (2.114)	Ignition: **ON**	0.3 – 0.5 A	Wiring, Y32
27.0	P1 522 P1 533	**Left adjustable camshaft timing solenoid (Y49/1)** Current draw	Y49/1 1 — (A) — 2	Connect test cable (102 589 04 63 00) to solenoid. Engine: **Start** and increase engine speed to 3000 rpm.	approx. 1.3 A	⇒ 27.1, ⇒ 29.0, N3/10
27.1		Resistance Y49/1 and Y49/2	N3/10 111 — (2.111) (Ω) — 113 (2.113)	Ignition: **OFF**	14 – 24 Ω [6]	Wiring, Y49/1 or Y49/2

[6] The resistance of one solenoid is 7 – 12 Ω.

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
28.0	P1 519 P1 525	**Right adjustable camshaft timing solenoid (Y49/2)** Current draw	Y49/2 1 — ◄ (A) ► — 2	Connect test cable (102 589 04 63 00) to solenoid. Engine: **Start** and increase engine speed to 3000 rpm.	approx. 1.3 A	⇒ 28.1, ⇒ 30.0, N3/10
28.1		Resistance Y49/2 and Y49/1	N3/10 113 — ◄ (Ω) ► — 111 (2.113) (2.111)	Ignition: **OFF**	14 – 24 Ω [6]	Wiring, Y49/2 or Y49/1
29.0	P1 522 P1 533	**Left adjustable camshaft timing solenoid (Y49/1)** Mechanical function	N3/10 111 — ◄ — ► — 38 (2.111) (1.38)	Engine: **at Idle** Bridge sockets on socket box for a maximum of 10 seconds.	Engine runs rough after approx. 5 seconds.	Check function of camshaft adjuster (see SMS, Engine 119, Job NO. 05-2160).
30.0	P1 519 P1 525	**Right adjustable camshaft timing solenoid (Y49/2)** Mechanical function	N3/10 113 — ◄ — ► — 38 (2.113) (1.38)	Engine: **at Idle** Bridge sockets on socket box for a maximum of 10 seconds.	Engine runs rough after approx. 5 seconds.	Check function of camshaft adjuster (see SMS, Engine 119, Job NO. 05-2160).

[6] The resistance of one solenoid is 7 – 12 Ω.

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
31.0	P0 440 P0 441 P0 443 P0 446	**Purge control valve (Y58/1)** Activation	N3/10 10 (1.10) — (+) — 25 (1.25)	Engine: **at Idle** and at operating temperature.	After approx. 1 minute, purge control valve (Y58/1) must noticeably cycle (Fig. 5 to 7) Signal: see Figure 8.	⇒ 31.1, ⇒ 32.0, N3/10
31.1		Current draw (Y58/1)	N3/10 38 (1.38) — (A) — 10 (1.10)	Ignition: **ON**	0.1 – 0.3 A	Wiring, Y58/1
32.0	P0 440 P0 441	**Purge control valve (Y58/1)** Vacuum control		Connect vacuum tester to purge control valve (Y58/1) connector (A) (Figure 5 and 6). Engine at operating temperature and at idle. Slowly increase engine speed to 3000 rpm.	After approx. 1 minute, > 50 mbar and needle oscillates.	Vacuum line, Y58/1

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
33.0	P0 440 P0 442 P0 446 P0 455	**Only** (USA), **Model 140, 210, Model 129 as of 09/97 Purge system** Leaks Activated charcoal canister shut-off valve (Y58/4) Activated	N3/10 26 (1.26) — 34 (1.34)	Disconnect purge line (A) to charcoal canister on purge control valve (Y58/1). Connect vacuum tester to purge line (Figure 6 and 7). Ignition: **ON** Apply approx. 25 mbar of vacuum.	 After approx. 1 minute, < 5 mbar vacuum loss.	Fuel tank cap, Purge line to charcoal canister, Purge line from charcoal canister to Y58/4, Charcoal canister, Y58/4
34.0	P0 446	**Only** (USA), **Model 140, 210, Model 129 as of 09/97 Activated charcoal canister shut-off valve (Y58/4)** Current draw	N3/10 38 (1.38) — 34 (1.34)	Ignition: **ON**	0.5 – 0.9 A	Wiring, Y58/4

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
35.0	P0 446 P0 450 P0 455	**Only** (USA), **Model 140, 210, Model 129 as of 09/97 Fuel tank pressure sensor (B4/3)** Sender signal Activated charcoal canister shut-off valve (Y58/4) activated	N3/10 53 (1.53) — (V) — 51 (1.51) N3/10 26 (1.26) — — 34 (1.34)	Disconnect purge line (A) to charcoal canister on purge control valve (Y58/1). Connect vacuum tester to purge line (Figure 6 and 7). Ignition: **ON** Apply approx. 25 mbar of vacuum.	 > 3 V < 2.5 V	⇒ 35.1, Wiring, Vacuum line, Charcoal canister plugged, B4/3
35.1		**Only** (USA) Fuel tank pressure sensor (B4/3) Voltage supply	N3/10 53 (1.53) — (V) — 44 (1.44)	Ignition: **ON**	4.7 – 5.3 V	N3/10

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
36.0	P0 450	**Only** (USA), **Model 129, up to 08/97** **Purge monitoring pressure sensor (B4/4)** Sender signal	N3/10 53 (1.53) — (V) — 51 (1.51)	Disconnect purge line on purge monitoring pressure sensor (B4/4). Connect vacuum tester to pressure sensor (Figure 5). Ignition: **ON** Apply approx. 300 mbar of vacuum.	> 3.5 V < 3 V	Wiring, ⇒ 36.1, B4/4
36.1		Fuel tank pressure sensor (B4/4) Voltage supply	N3/10 53 (1.53) — (V) — 44 (1.44)	Ignition: **ON**	4.7 – 5.3 V	N3/10

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
37.0	P0 600 P1 570 P1 747	**CAN data bus**	N3/10 60 (1.60) — Ω — 61 (1.61)	Ignition: **OFF** Disconnect connector 1 from test cable and measure resistance directly at connector 1 (interior) of engine harness using an ohmmeter. Wire connections see 22	115 – 125 Ω	⇒ 37.1, Data line.
37.1		Model 129/140 up to 05/96 CAN element in RCL control module (N54) Model 129/140 as of 06/96 and Model 210.072 CAN element in DAS control module (N54/1) Resistance	N54 N54/1 L — Ω — H	Ignition: **OFF** Disconnect control module (N54 or N54/1) and test directly at pins of control module (Figure 10).	115 – 125 Ω	N54 or N54/1

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
38.0		**CAN element in engine control module (N3/10)** Resistance	N3/10 60 — Ω — 61	Ignition: **OFF** Disconnect control module connector 1 (interior) from N3/10 and test directly at control module.	115 – 125 Ω	N3/10
39.0	P1 163	**Oil level switch (S43)**	N3/10 32 (1.32) — V — 25 (1.25)	Ignition: **ON** Oil level okay. Oil level low.	 11 – 14 V < 1 V	Wiring, S43
40.0		**Model 129/140 up to 05/96** **Model 210 up to 05/97 (afterwards via CAN)** **Fuel consumption signal**	N3/10 25 (1.25) — V — 58 (1.58)	Engine: **at Idle** and briefly accelerate engine.	> 0.5 V	Wiring, N3/10
41.0		Diagnosis line Activation	N3/10 26 (1.26) — V — 55 (1.55)	Ignition: **ON**	11 – 14 V	Wiring, N3/10

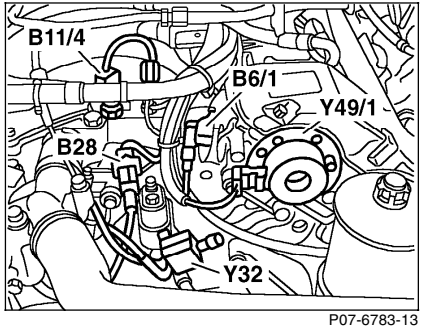
Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
42.0	P1 605	**(only until 05/96, as of 06/96 deleted)** **Body acceleration sensor (B24)**				Wiring, ⇒ 42.1, B24
		Sensor signal static	N3/10 53 (1.53) — V — 48 (1.48)	Ignition: **ON**	2.35 – 2.65 V	
		Sensor signal dynamic	N3/10 53 (1.53) — V — 48 (1.48)	Vigorously move left front corner of vehicle by hand.	> 5 mV Note: Value changes with movement.	
42.1		Voltsge supply (B24/7)	N3/10 53 (1.53) — V — 44 (1.44)	Ignition: **ON**	4.7 – 5.3 V	N3/10
43.0	P1 444	***Not applicable to U.S.A. version vehicles***				
44.0	P1 437 P1 444	***Not applicable to U.S.A. version vehicles***				

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
45.0		**Model 140 til 05/96** **Model 210 til 05/97** **(afterwards via CAN)** **Fuel tank cap open signal**	N3/10 23 (1.23) — 25 (1.25)	Engine: **at Idle** Tank cap open Tank cap closed after approx. 18 minutes	 11 – 14 V < 1 V	Leak in purge system, ⇒ 33.0
46.0		**Model 140 til 05/96** **Model 210 til 05/97** **(afterwards via CAN)** **“CHECK ENGNE”** **MIL (A1e26)**	N3/10 11 (1.11) — 25 (1.25)	Ignition: **ON**	11 – 14 V	N3/10
47.0		**Engine control module** **(ME-SFI) coding** Bridge	N3/10 73 (2.73) — 96 (2.96)	Ignition: **OFF**	< 1 Ω	Wiring.

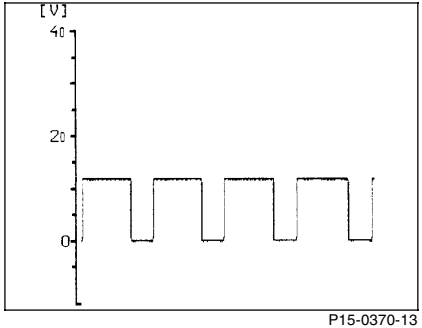
Electrical Test Program – Sequential Multiport Fuel Injection System Test



P07-6783-13

Figure 1

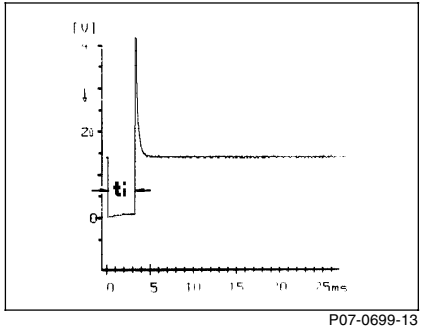
B28 Pressure sensor



P15-0370-13

Figure 2

TN signal

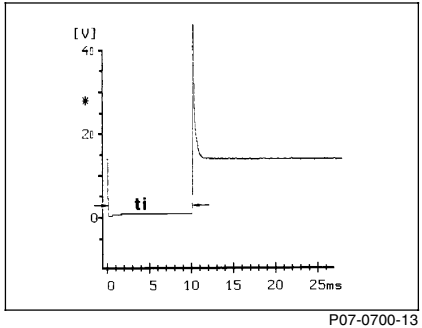


P07-0699-13

Figure 3

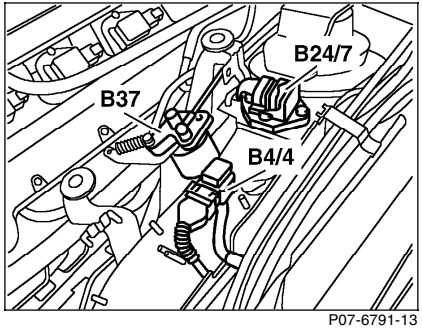
Injection duration “ti” at CTP

Electrical Test Program – Sequential Multiport Fuel Injection System Test



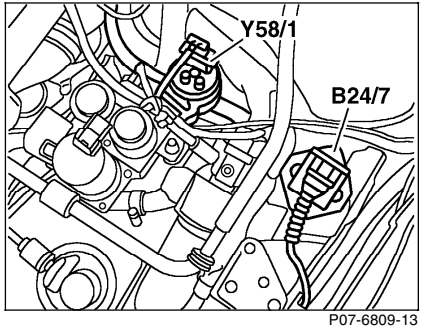
P07-0700-13

Figure 4
Injection duration “ti” at WOT



P07-6791-13

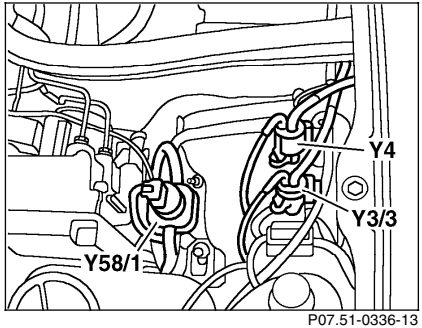
Figure 5
Model 129
B4/4 Fuel tank emissions monitoring pressure sensor



P07-6809-13

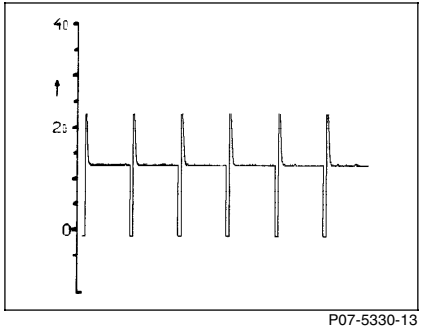
Figure 6
Model 140
Y58/1 Purge control valve

Electrical Test Program – Sequential Multiport Fuel Injection System Test



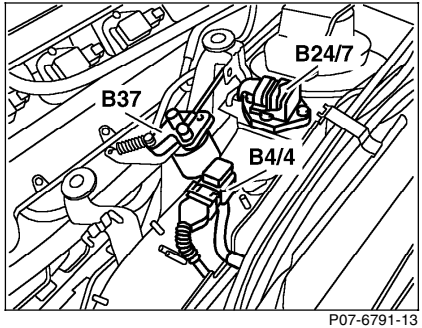
P07.51-0336-13

Figure 7
Model 210
Y58/1 Purge control valve



P07-5330-13

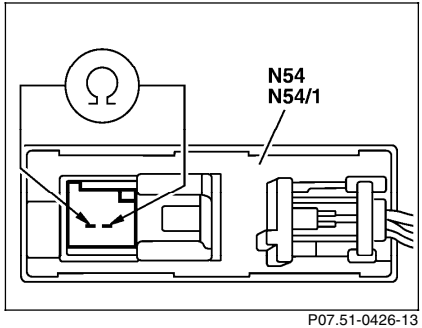
Figure 8
Purge control valve signal



P07-6791-13

Figure 9
Model 129 (USA)
B4/4 Fuel tank emissions monitoring pressure sensor

Electrical Test Program – Sequential Multiport Fuel Injection System Test



P07.51-0426-13

Figure 10

N54 RCL control module
N54/1 DAS control module

Electrical Test Program – Ignition System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
1.0	P0 560	**Engine control module (N3/10)** Voltage supply circuit 30	N3/10 26 (1.26) — V — 35 (1.35)	Ignition: **ON**	11 – 14 V	⇒ 1.1
1.1		Ground wire	N3/10 26 (1.26) — V — X11/4 2 39 (1.39) — V — 2	Ignition: **ON**	11 – 14 V	Wiring, **Model 129** Ground (W27), module box bracket. **Model 140** Output ground (W15), right footwell. **Model 210** Electronic ground (W16/6), right component compartment, ⇒ 1.2
1.2		Voltage supply circuit 30	X11/4 1 — V — N3/10 35 (1.35)	Ignition: **ON**	11 – 14 V	Wire, **Model 129, 140** base module (N16/1) or fuse on base module, **Model 210** relay module (K40).

Electrical Test Program – Ignition System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
2.0	P0 560	**Engine control module (N3/10)** Voltage supply circuit 87M	N3/10 38 — (1.38) 25 — (1.25)	Ignition: **ON**	11 – 14 V	⇒ 2.1
2.1		Electronics ground	N3/10 38 — (1.38) X11/4 2	Ignition: **ON**	11 – 14 V	Wiring, **Model 129, 140** Electronics ground (W15/1), right footwell, **Model 210** Electronics ground (W16/6), right component compartment, ⇒ 2.2
2.2		Voltage supply circuit 87	X11/4 1 — N3/10 25 — (1.25)	Ignition: **ON** Ignition: **OFF**	11 – 14 V < 1 V	Wiring, **Model 129, 140** base module (N16/1) or fuse on base module, **Model 210** relay module (K40).
3.0	P0 560	**Engine control module (N3/10)** Voltage supply circuit 87M	N3/10 39 — (1.39) 36 — (1.36)	Ignition: **ON** Ignition: **OFF**	11 – 14 V < 1 V	Wiring, **Model 129, 140** base module (N16/1) or fuse on base module, **Model 210** relay module (K40).

Electrical Test Program – Ignition System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
4.0		**Ignition coil (T1/1)** Voltage supply	N3/10  26 (1.26) — 83 (2.83)	Ignition: **ON** Starter: **Crank**	11 – 14 V > 10 V	Wiring. Model 210, 129 as of 09/95 and Model 140 as of 06/96 fused as follows: Model 129 fuse 34 Model 140 fuse 22 Model 210 fuse 19
5.0		**Ignition coil (T1/2)** Voltage supply	N3/10  26 (1.26) — 117 (2.117)	Ignition: **ON** Starter: **Crank**	11 – 14 V > 10 V	Wiring. Model 210, 129 as of 09/95 and Model 140 as of 06/96 fused as follows: Model 129 fuse 34 Model 140 fuse 22 Model 210 fuse 19
6.0		**Ignition coil (T1/3)** Voltage supply	N3/10  26 (1.26) — 115 (2.115)	Ignition: **ON** Starter: **Crank**	11 – 14 V > 10 V	Wiring. Model 210, 129 as of 09/95 and Model 140 as of 06/96 fused as follows: Model 129 fuse 34 Model 140 fuse 22 Model 210 fuse 19

Electrical Test Program – Ignition System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
7.0		**Ignition coil (T1/4)** Voltage supply	N3/10  26 (1.26) — 85 (2.85)	Ignition: **ON** Starter: **Crank**	11 – 14 V > 10 V	Wiring. Model 210, 129 as of 09/95 and Model 140 as of 06/96 fused as follows: Model 129 fuse 34 Model 140 fuse 22 Model 210 fuse 19
8.0		**Ignition coil (T1/5)** Voltage supply	N3/10  26 (1.26) — 84 (2.84)	Ignition: **ON** Starter: **Crank**	11 – 14 V > 10 V	Wiring. Model 210, 129 as of 09/95 and Model 140 as of 06/96 fused as follows: Model 129 fuse 34 Model 140 fuse 22 Model 210 fuse 19
9.0		**Ignition coil (T1/6)** Voltage supply	N3/10  26 (1.26) — 94 (2.94)	Ignition: **ON** Starter: **Crank**	11 – 14 V > 10 V	Wiring. Model 210, 129 as of 09/95 and Model 140 as of 06/96 fused as follows: Model 129 fuse 34 Model 140 fuse 22 Model 210 fuse 19

Electrical Test Program – Ignition System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
10.0		**Ignition coil (T1/7)** Voltage supply	N3/10 26 (1.26) — V — 116 (2.116)	Ignition: **ON** Starter: **Crank**	11 – 14 V > 10 V	Wiring. Model 210, 129 as of 09/95 and Model 140 as of 06/96 fused as follows: Model 129 fuse 34 Model 140 fuse 22 Model 210 fuse 19
11.0		**Ignition coil (T1/8)** Voltage supply	N3/10 26 (1.26) — V — 95 (2.95)	Ignition: **ON** Starter: **Crank**	11 – 14 V > 10 V	Wiring. Model 210, 129 as of 09/95 and Model 140 as of 06/96 fused as follows: Model 129 fuse 34 Model 140 fuse 22 Model 210 fuse 19
12.0	P0 335	**CKP sensor (L5)**	N3/10 [2] 78 (2.78) — ⏚ — 89 (2.89) N3/10 [3] 78 (2.78) — V — 89 (2.89)	Starter: **Crank** Engine: **at Idle** Starter: **Crank** Engine: **at Idle**	Signal, see Figure 1 and 3. > 2.5 V > 5 V [4]	⇒ 12.1, Teeth on starter ring gear.

2) Test with oscilloscope.
3) Test with multimeter only if oscilloscope is unavailable.
4) Voltage increases with increasing rpm.

Electrical Test Program – Ignition System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
12.1		Resistance of CKP sensor (L5)	N3/10 78 (2.78) — Ω — 89 (2.89)	Ignition: **OFF** Unplug connector 2 on engine control module (N3/10).	700 – 1400 Ω	L5
13.0	P0 341	**Camshaft Hall-effect sensor (B6/1)** Hall-effect signal	N3/10 [2] 87 (2.87) — ⏚ — 66 (2.66)	Engine: **at Idle**	Signal, see Figure 2 and 3.	⇒ 13.1, B6/1
			N3/10 [3] 66 (2.66) — V — 25 (1.25)	Engine: **at Idle**	1.2 – 1.7 V Value changes	
13.1		Voltage supply to camshaft Hall-effect sensor (B6/1)	B6/1 1 — V — 3	Ignition: **ON** Disconnect connector from Hall-effect sensor (B6/1) and test directly on sockets 1 and 3 of connector.	11 – 14 V	Wiring.

[2] Test with oscilloscope.
[3] Test with multimeter only if oscilloscope is unavailable.

Electrical Test Program – Ignition System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
14.0		**Closing duration for ignition coil (T1/1)**	N3/10 83 (2.83) — 25 (1.25)	Starter: **Crank** Engine: **at Idle**	20 – 100 ms 2 – 4 ms	⇒ 12.0, ⇒ 14.1, N3/10
14.1		Rest current shut-off: T1/1	N3/10 83 (2.83) — 25 (1.25)	Ignition: **ON** Starter: **Crank**	0 V 0.3 – 0.6 V	T1/1, N3/10, < 0.3 V: wire from T1/1 to N3/10, > 0.6 V: T1/1.
15.0		**Closing duration for ignition coil (T1/2)**	N3/10 117 (2.117) — 25 (1.25)	Starter: **Crank** Engine: **at Idle**	20 – 100 ms 2 – 4 ms	⇒ 12.0, ⇒ 15.1, N3/10
15.1		Rest current shut-off: T1/2	N3/10 117 (2.117) — 25 (1.25)	Ignition: **ON** Starter: **Crank**	0 V 0.3 – 0.6 V	T1/2, N3/10, < 0.3 V: wire from T1/2 to N3/10, > 0.6 V: T1/2

Electrical Test Program – Ignition System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
16.0		**Closing duration for ignition coil (T1/3)**	N3/10 115 (2.115) — 25 (1.25)	Starter: **Crank** Engine: **at Idle**	20 – 100 ms 2 – 4 ms	⇒ 12.0, ⇒ 16.1, N3/10
16.1		Rest current shut-off: T1/3	N3/10 115 (2.115) — 25 (1.25)	Ignition: **ON** Starter: **Crank**	0 V 0.3 – 0.6 V	T1/3, N3/10, < 0.3 V: wire from T1/3 to N3/10, > 0.6 V: T1/3.
17.0		**Closing duration for ignition coil (T1/4)**	N3/10 85 (2.85) — 25 (1.25)	Starter: **Crank** Engine: **at Idle**	20 – 100 ms 2 – 4 ms	⇒ 12.0, ⇒ 17.1, N3/10
17.1		Rest current shut-off: T1/4	N3/10 85 (2.85) — 25 (1.25)	Ignition: **ON** Starter: **Crank**	0 V 0.3 – 0.6 V	T1/4, N3/10, < 0.3 V: wire from T1/4 to N3/10, > 0.6 V: T1/4

Electrical Test Program – Ignition System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
18.0		**Closing duration for ignition coil (T1/5)**	N3/10 84 (2.84) — (1.25) 25	Starter: **Crank** Engine: **at Idle**	20 – 100 ms 2 – 4 ms	⇒ 12.0, ⇒ 18.1, N3/10
18.1		Rest current shut-off: T1/5	N3/10 84 (2.84) — (1.25) 25	Ignition: **ON** Starter: **Crank**	0 V 0.3 – 0.6 V	T1/5, N3/10, < 0.3 V: wire from T1/5 to N3/10, > 0.6 V: T1/5.
19.0		**Closing duration for ignition coil (T1/6)**	N3/10 94 (2.94) — (1.25) 25	Starter: **Crank** Engine: **at Idle**	20 – 100 ms 2 – 4 ms	⇒ 12.0, ⇒ 19.1, N3/10
19.1		Rest current shut-off: T1/6	N3/10 94 (2.94) — (1.25) 25	Ignition: **ON** Starter: **Crank**	0 V 0.3 – 0.6 V	T1/6, N3/10, < 0.3 V: wire from T1/6 to N3/10, > 0.6 V: T1/6

Electrical Test Program – Ignition System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
20.0		**Closing duration for ignition coil (T1/7)**	N3/10 116 (2.116) — 25 (1.25)	Starter: **Crank** Engine: **at Idle**	20 – 100 ms 2 – 4 ms	⇒ 12.0, ⇒ 20.1, N3/10
20.1		Rest current shut-off: T1/7	N3/10 116 (2.116) — 25 (1.25)	Ignition: **ON** Starter: **Crank**	0 V 0.3 – 0.6 V	T1/7, N3/10, < 0.3 V: wire from T1/7 to N3/10, > 0.6 V: T1/7
21.0		**Closing duration for ignition coil (T1/8)**	N3/10 95 (2.95) — 25 (1.25)	Starter: **Crank** Engine: **at Idle**	20 – 100 ms 2 – 4 ms	⇒ 12.0, ⇒ 21.1, N3/10
21.1		Rest current shut-off: T1/8	N3/10 95 (2.95) — 25 (1.25)	Ignition: **ON** Starter: **Crank**	0 V 0.3 – 0.6 V	T1/8, N3/10, < 0.3 V: wire from T1/8 to N3/10, > 0.6 V: T1/8

Electrical Test Program – Ignition System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
22.0	P0 300 P0 301	**Primary voltage** Ignition coil (T1/1)	N3/10 83 (2.83) — 25 (1.25)	**Test connection Note:** Individual primary pattern Range 400 V Duration 100% Starter: **Crank**	200 – 350 V	⇒ 22.1, N3/10
22.1		Primary winding of T1/1 and T1/2	N3/10 83 (2.83) — 117 (2.117)	Ignition: **OFF**	0.9 – 1.4 Ω [6]	Wiring T1/1 or T1/2
23.0	P0 300 P0 302	**Primary voltage** Ignition coil (T1/2)	N3/10 117 (2.117) — 25 (1.25)	**Test connection Note:** Individual primary pattern Range 400 V Duration 100% Starter: **Crank**	200 – 350 V	⇒ 23.1, N3/10
23.1		Primary winding of T1/2 and T1/1	N3/10 117 (2.117) — 83 (2.83)	Ignition: **OFF**	0.9 – 1.4 Ω [6]	Wiring T1/2 or T1/1

[6] The resistance of a single coil is 0.5 – 0.7 Ω

Electrical Test Program – Ignition System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
24.0	P0 300 P0 303	**Primary voltage** Ignition coil (T1/3)	N3/10 115 (2.115) — 25 (1.25)	**Test connection Note:** Individual primary pattern Range 400 V Duration 100% Starter: **Crank**	200 – 350 V	⇒ 24.1, N3/10
24.1		Primary winding of T1/3 and T1/4	N3/10 115 (2.115) — 85 (2.85)	Ignition: **OFF**	0.9 – 1.4 Ω 6)	Wiring T1/3 or T1/4
25.0	P0 300 P0 304	**Primary voltage** Ignition coil (T1/4)	N3/10 85 (2.85) — 25 (1.25)	**Test connection Note:** Individual primary pattern Range 400 V Duration 100% Starter: **Crank**	200 – 350 V	⇒ 25.1, N3/10
25.1		Primary winding of T1/4 and T1/3	N3/10 85 (2.85) — 115 (2.115)	Ignition: **OFF**	0.9 – 1.4 Ω 6)	Wiring T1/4 or T1/3

6) The resistance of a single coil is 0.5 – 0.7 Ω

Electrical Test Program – Ignition System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
26.0	P0 300 P0 305	**Primary voltage** Ignition coil (T1/5)	N3/10 84 (2.84) — 25 (1.25)	**Test connection Note:** Individual primary pattern Range 400 V Duration 100% Starter: **Crank**	200 – 350 V	⇒ 26.1, N3/10
26.1		Primary winding of T1/5 and T1/6	N3/10 84 (2.84) — 94 (2.94)	Ignition: **OFF**	0.9 – 1.4 Ω 6)	Wiring T1/5 or T1/6
27.0	P0 300 P0 306	**Primary voltage** Ignition coil (T1/6)	N3/10 94 (2.94) — 25 (1.25)	**Test connection Note:** Individual primary pattern Range 400 V Duration 100% Starter: **Crank**	200 – 350 V	⇒ 27.1, N3/10
27.1		Primary winding of T1/6 and T1/5	N3/10 94 (2.94) — 84 (2.84)	Ignition: **OFF**	0.9 – 1.4 Ω 6)	Wiring T1/6 or T1/5

6) The resistance of a single coil is 0.5 – 0.7 Ω

Electrical Test Program – Ignition System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
28.0	P0 300 P0 307	**Primary voltage** Ignition coil (T1/7)	N3/10 116 (2.116) — 25 (1.25)	**Test connection Note:** Individual primary pattern Range 400 V Duration 100% Starter: **Crank**	200 – 350 V	⇒ 28.1, N3/10
28.1		Primary winding of T1/7 and T1/8	N3/10 116 (2.116) — 95 (2.95)	Ignition: **OFF**	0.9 – 1.4 Ω 6)	Wiring T1/7 or T1/8
29.0	P0 300 P0 308	**Primary voltage** Ignition coil (T1/8)	N3/10 95 (2.95) — 25 (1.25)	**Test connection Note:** Individual primary pattern Range 400 V Duration 100% Starter: **Crank**	200 – 350 V	⇒ 29.1, N3/10
29.1		Primary winding of T1/8 and T1/7	N3/10 95 (2.95) — 116 (2.116)	Ignition: **OFF**	0.9 – 1.4 Ω 6)	Wiring T1/8 or T1/7

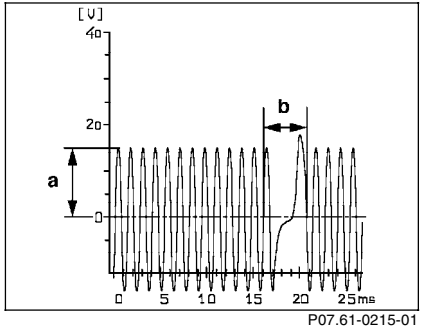
6) The resistance of a single coil is 0.5 – 0.7 Ω

Electrical Test Program – Ignition System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
30.0	P0 300 P0 301 P0 302 P0 303 P0 304 P0 305 P0 306 P0 307 P0 308	**Firing voltage** Ignition coil (T1/1) to (T1/8)	Engine analyzer	**Test connection Note:** Individual secondary pattern Range 20 kV Duration 100% Connect kV pick-ups successively to T1/1 through T1/8. Starter: **Crank**	8 – 20 kV [5]	Spark plugs, T1/1 to T1/8, N3/10

[5] The resistance of the secondary winding can not be measured due to an installed diode.

Electrical Test Program – Ignition System Test



P07.61-0215-01

Figure 1

CKP sensor (L5) signal

b=2 missing teeth for cylinder 1 recognition

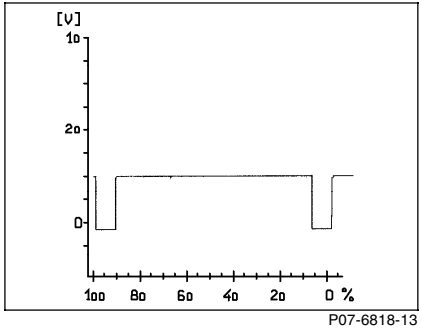


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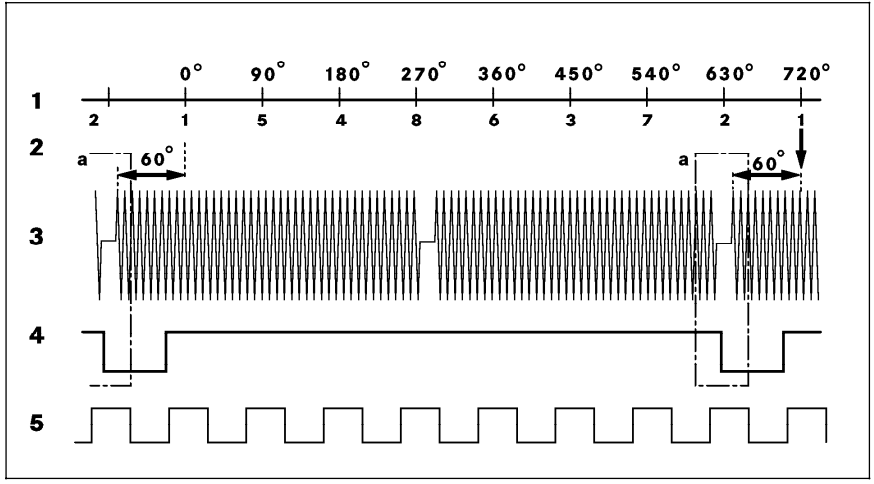
Figure 2

Camshaft Hall-effect sensor (B6/1) signal

Electrical Test Program – Ignition System Test

Signal survey

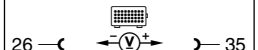
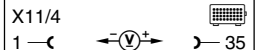


P07.61-0217-55

Figure 3

1 Crank angle (CKA)
2 Cylinder
3 CKP sensor (L5) signal
4 Camshaft Hall-effect sensor (B6/1) signal
5 Engine rpm signal TNA
a Cylinder 1 recognition

Electrical Test Program – Electronic Accelerator (EA) Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
1.0	P0 560	**Engine control module (N3/10)** Voltage supply Circuit 30	N3/10  26 (1.26) — 35 (1.35)	Ignition: **ON**	11 – 14 V	⇒ 1.1
1.1		Ground wire	N3/10  26 (1.26) — X11/4 2 39 (1.39) — X11/4 2	Ignition: **ON**	11 – 14 V	Wiring, **Model 129:** Ground (W27), module box bracket. **Model 140:** Output ground (W15), right footwell. **Model 210:** Electronic ground (W16/6), right component compartment, ⇒ 1.2
1.2		Voltage supply Circuit 30	X11/4 1 — N3/10  35 (1.35)	Ignition: **ON**	11 – 14 V	Wiring, **Model 129, 140:** Base module (N16/1) or fuse on base module. **Model 210:** Relay module (K40).

Electrical Test Program – Electronic Accelerator (EA) Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
2.0	P0 560	**Engine control module (N3/10)** Voltage supply Circuit 87M	N3/10 38 (1.38) — V — 25 (1.25)	Ignition: **ON**	11 – 14 V	⇒ 2.1
2.1		Electronic ground	N3/10 38 (1.38) — V — X11/4 2	Ignition: **ON**	11 – 14 V	Wiring, **Model 129, 140:** Electronic ground (W15), right footwell. **Model 210:** Electronic ground (W16/6), right component compartment, ⇒ 2.2
2.2		Voltage supply Circuit 87M	X11/4 1 — V — N3/10 25 (1.25)	Ignition: **ON**	11 – 14 V	Wiring, **Model 129, 140:** Base module (N16/1) or fuse on base module. **Model 210:** Relay module (K40).

Electrical Test Program – Electronic Accelerator (EA) Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
3.0	P0 560	**Engine control module (N3/10)** Voltage supply Circuit 87E	N3/10 39 (1.39) — 36 (1.36)	Ignition: **ON**	11 – 14 V	Wiring, **Model 129, 140:** Base module (N16/1) or fuse on base module. **Model 210:** Relay module (K40).
4.0	P1 542 P0 507	**Pedal value sensor (B37)** Signal Nominal value potentiometer 1	N3/10 18 (1.18) — 19 (1.19)	Ignition: **ON** Accelerator pedal position: CTP WOT	 0.2 – 0.5 V 4.3 – 4.8 V	⇒ 4.1, Wiring, B37
4.1		Voltage supply Nominal value potentiometer 1	N3/10 18 (1.18) — 17 (1.17)	Ignition: **ON**	4.75 – 5.25 V	N3/10

Electrical Test Program – Electronic Accelerator (EA) Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
5.0	P1 542 P0 507	**Pedal value sensor (B37)** Signal Nominal value potentiometer 2	N3/10  5 (1.5) — 6 (1.6)	Ignition: **ON** Accelerator pedal position: CTP WOT	 0.1 – 0.4 V 2.1 – 2.5 V	Wiring, ⇒ 5.1, B37
5.1		Voltage supply Nominal value potentiometer 2	N3/10  5 (1.5) — 4 (1.4)	Ignition: **ON**	2.25 – 2.75 V	N3/10
6.0	P0 507 P0 120 P0 186	**EA/CC/ISC actuator (M16/1)** Signal Actual value potentiometer 1 Actual value potentiometer 2	N3/10  98 (2.98) — 97 (2.97) N3/10  98 (2.98) — 107 (2.107)	Ignition: **ON** Accelerator pedal position: CTP WOT Accelerator pedal position: CTP WOT	 4.0 – 4.6 V < CTP value 0.3 – 0.9 V > CTP value	Wiring, ⇒ 6.1, M16/1

Electrical Test Program – Electronic Accelerator (EA) Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
6.1		Voltage supply Actual value potentiometers 1 and 2	N3/10 98 (2.98) — V — 106 (2.106)	Ignition: **ON**	4.75 – 5.25 V	N3/10
7.0	P0 186 P1 580	**EA/CC/ISC actuator (M16/1)** Activation of actuator motor	N3/10 74 (2.74) — V — 75 (2.75)	Ignition: **ON** Engine: **at Idle** ECT > 70 °C	1.0 – 2.3 V 1.0 – 2.5 V Value oscillates.	Wiring, M16/1, N3/10
		Resistance (actuator motor)	N3/10 74 (2.74) — Ω — 75 (2.75)	Ignition: **OFF**	< 10 Ω	
8.0	P0 500	**Left front axle VSS sensor (L6/1)**	N3/10 38 (1.38) — V — 9 (1.9)	Raise front of vehicle. Ignition: **ON** Spin left front wheel by hand.	 4 – 8 V	Wiring, ASR or ESP see DM, Chassis & Drivetrain, Vol. 3, section 9 (ASR, ETS, ESP).

Electrical Test Program – Electronic Accelerator (EA) Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
9.0	P0 500	**Left rear axle VSS sensor (L6/3)**	N3/10  38 (1.38) — 22 (1.22)	Raise rear of vehicle. Ignition: **ON** Spin left rear wheel by hand.	4 – 8 V	Wiring, ASR or ESP see DM, Chassis & Drivetrain, Vol. 3, section 9 (ASR, ETS, ESP).
10.0		**(only until 05/96, as of 06/96 via CAN)** **A/C compressor signal**	N3/10  38 (1.38) — 8 (1.8)	Engine: **at Idle** **Turn A/C system: ON** Move temperature selector wheel to MIN, blower: **ON**.	< 1.0 V 11 – 14 V	Wiring, A/C pushbutton control module (N22).
11.0		**EPC MIL (A1e43)** Activation	N3/10  21 (1.21) — 35 (1.35)	Ignition: **ON** Engine: **at Idle**	11 – 14 V < 1 V	Wiring, Malfunction in actuator or pedal value sensor, N3/10

Electrical Test Program – Cruise Control (CC) Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
1.0	P0 565	**CC switch (S40)**	N3/10	Ignition: **ON**		Wiring,
				CC switch not activated.	< 1 V	S40
		V Decelerate/set	26 (1.26) — V — 31 (1.31)			
				Decelerate activated.	11 – 14 V	
		B Accelerate/set	N3/10	Ignition: **ON**		
			26 (1.26) — V — 2 (1.2)	Accelerate activated.	11 – 14 V	
		SP Memory recall	N3/10	Ignition: **ON**		
			26 (1.26) — V — 30 (1.30)	Memory activated.	11 – 14 V	
		Off	N3/10	Ignition: **ON**	11 – 14 V	
			38 (1.38) — V — 28 (1.28)	Off activated.	< 1 V	
		Control contact	N3/10	Ignition: **ON**		
				CC switch not activated.	< 1 V	
			38 (1.38) — V — 27 (1.27)			
				Activate decelerate/ accelerate/memory/off	11 – 14 V	

Electrical Test Program – Cruise Control (CC) Test

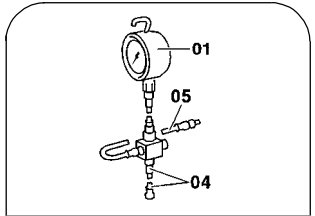
⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
2.0	P1 584	**Stop lamp switch (S9/1)** N.O. contact	N3/10  26 (1.26) — 1 (1.1)	Ignition: **ON** Brake pedal not applied. Brake pedal applied.	< 1 V 11 – 14 V	Wiring, S9/1
		N.C. contact	N3/10  26 (1.26) — 3 (1.3)	Ignition: **ON** Brake pedal not applied. Brake pedal applied.	11 – 14 V < 1 V	Wiring, S9/1
3.0	P0 500	**Left front axle VSS sensor (L6/1)**	N3/10  38 (1.38) — 9 (1.9)	Raise front of vehicle. Ignition: **ON** Spin left front wheel by hand.	4 – 8 V	Wiring, See DM, Chassis & Drivetrain, Vol. 3, section 9 (ASR, ETS, ESP).
4.0	P0 500	**Left rear axle VSS sensor (L6/3)**	N3/10  38 (1.38) — 22 (1.22)	Raise rear of vehicle. Ignition: **ON** Spin left rear wheel by hand.	4 – 8 V	Wiring, See DM, Chassis & Drivetrain, Vol. 3, section 9 (ASR, ETS, ESP).

Hydraulic Test Program – Preparation for Test (Fuel System Pressure and Internal Leakage Test)

Preparation for Test

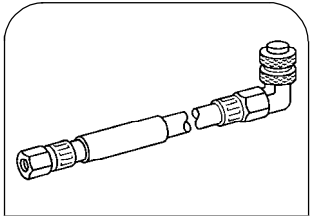
- Connect pressure gauge to test connection.
- After completing test, using measurement glass (055), release fuel pressure and allow residual fuel to drain into glass (see Figure 1).

Special Tools



103 589 00 21 00

Tester

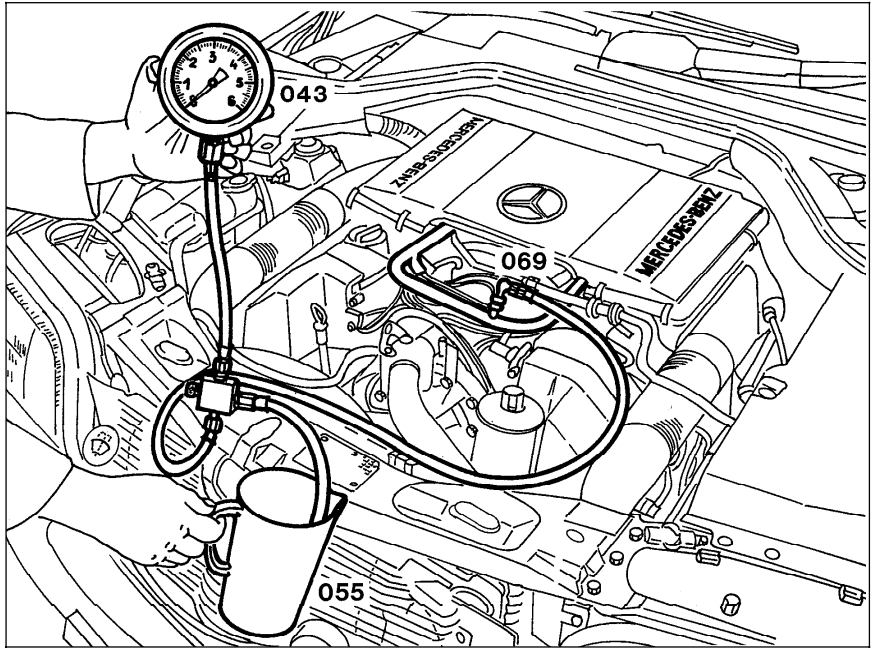


119 589 04 63 00

Pressure hose

Hydraulic Test Program – Preparation for Test (Fuel System Pressure and Internal Leakage Test)

Connection Diagram



P07-2641-57

Figure 1

043 Pressure gauge, part no. 103 589 00 21 00
055 Measurement glass
069 Pressure hose, part no. 119 589 04 63 00

Hydraulic Test Program – Test (Fuel System Pressure and Internal Leakage Test)

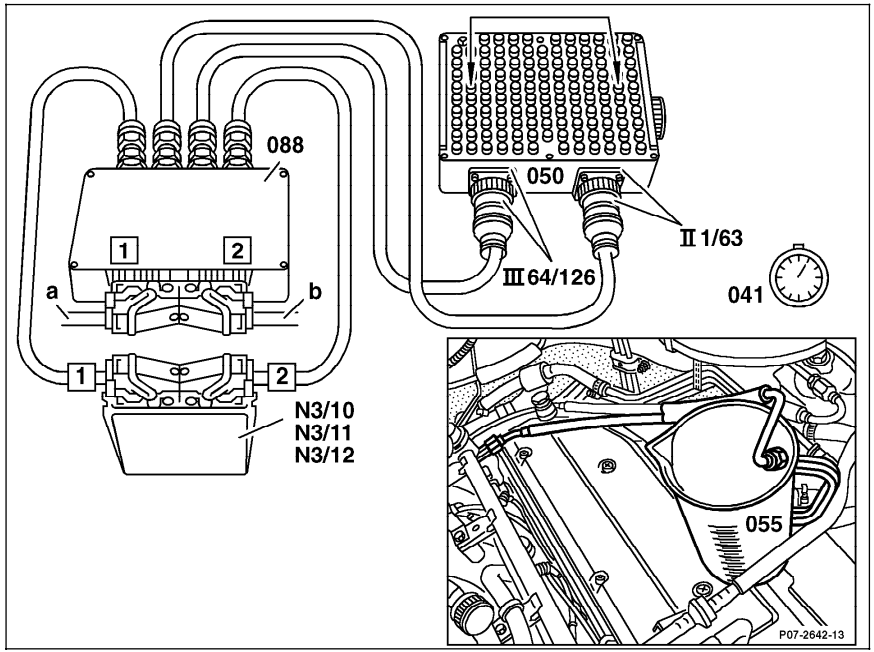
⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy [1]
1.0		**Fuel pressure at idle (with vacuum)**	Pressure gauge connected to test connection.	Engine: **at Idle** Valve on pressure gauge closed.	3.2 – 3.6 bar	Check fuel pumps 33, Replace diaphragm pressure regulator.
2.0		**Fuel pressure at idle (without vacuum)**	Pressure gauge connected to test connection.	Engine: **at Idle** Disconnect vacuum hose from diaphragm pressure regulator.	3.7 – 4.2 bar	Replace diaphragm pressure regulator.
3.0		**Fuel system leakage**	Pressure gauge connected to test connection.	Engine: **OFF** After 30 minutes	> 3.0 bar > 2.5 bar	If the pressure drops quickly, replace check valve in fuel pumps. If the pressure drops slowly, check injectors 36, Replace diaphragm pressure regulator or O-rings on diaphragm pressure regulator.

[1] Observe Preparation for Test, see 31.

Hydraulic Test Program – Preparation forTest (Fuel Pump Test)

Connection Diagram – Delivery Test

- Connect socket box tester to engine control module (N3/10)



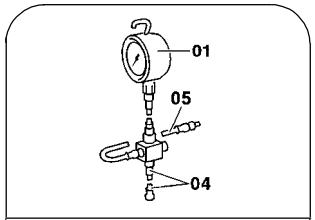
P07-6830-57

Figure 1

003	Digital multimeter
041	Stop watch
050	Socket box tester, 126 pole
055	Measuring glass
088	Test cable
N3/10	Engine control module (ME-SFI)
a	Interior wiring harness
b	Engine compartment wiring harness

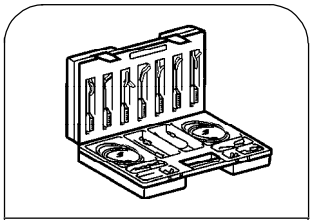
Hydraulic Test Program – Preparation forTest (Fuel Pump Test)

Special Tools



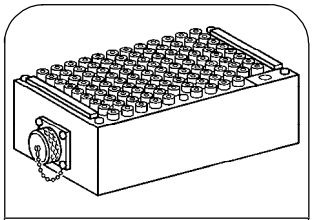
103 589 00 21 00

Tester



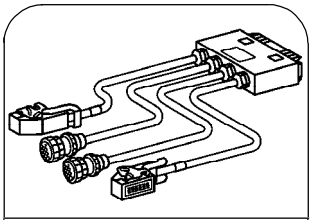
201 589 00 99 00

Electrical connecting set



129 589 00 21 00

126-pin socket box



140 589 46 63 00

Test cable, 117-pin

Conventional tools, test equipment

Description	Brand, model, etc.
Multimeter 1)	Fluke models 23, 83, 85, 87
Stop watch	local purchase
Measuring glass (1 liter minimum)	local purchase

1) Available through the MBUSA Standard Equipment Program.

Hydraulic Test Program – Test (Fuel Pump Test)

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy [1]
1.0		**Fuel pumps** Delivery capacity	N3/10  26 (1.26)  24 (1.24)	Disconnect fuel return hose from fuel line and place end in measuring glass. Ignition: **ON**	1 liter of fuel within 35 seconds.	Check fuel lines for restrictions (kinks and dents). Replace fuel filter, ⇒ 2.0
2.0		**Fuel pumps** Current draw Connect multimeter to sockets 1 and 3 (Figure 1)		Disconnect fuel pumps relay module (K27). Ignition: **ON**	4 – 9 A	Fuel pumps

[1] Observe Preparation for Test, see 33.

Hydraulic Test Program – Test (Fuel Pump Test)

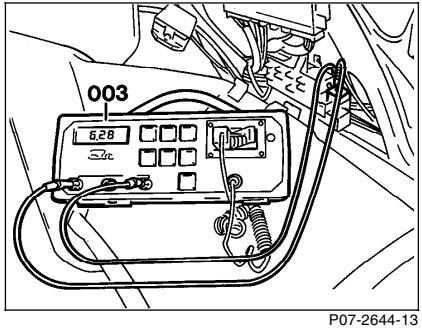


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Figure 1
003 Multimeter

Hydraulic Test Program – Preparation for Test (Injector Test)

Preparation for Test

1. Connect socket box tester to engine control module (N3/10).
2. Disconnect 2-pole connectors on injectors.
3. Remove fuel rail with injectors, thereby **not** disconnecting the fuel feed and return lines.
4. Connect self-made harness (048) to each injector one after another.
5. Hold each injector in measuring glass one after another.

⚠

Connect interior harness connector to connection 1 on test cable
Connect engine harness connector to connection 2 on test cable

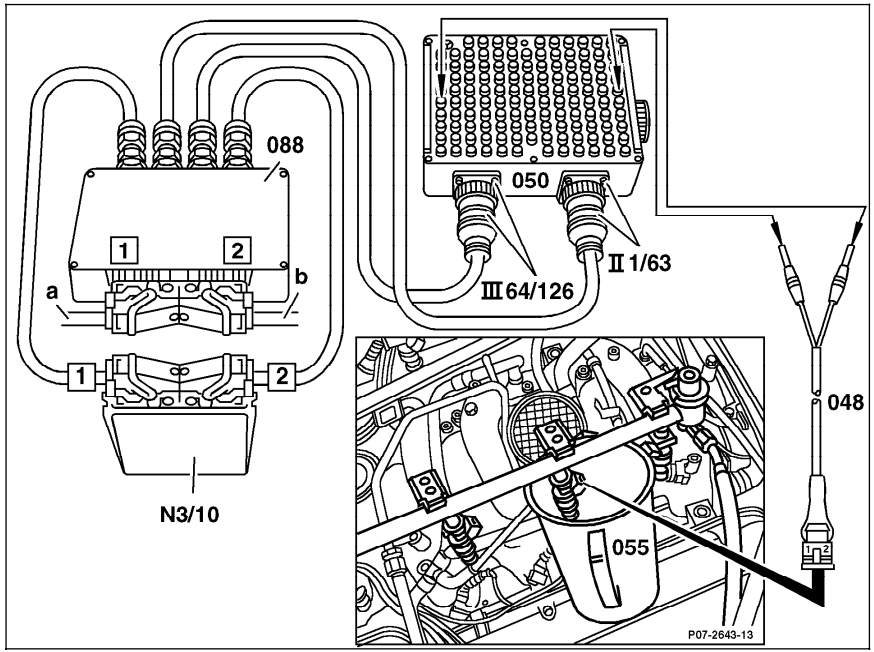

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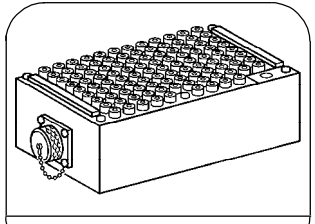
Figure 1

048	Self made harness
050	Socket box tester, 126 pole
055	Measuring glass
088	Test cable
N3/10	Engine control module (ME-SFI)
a	Interior wiring harness
b	Engine compartment harness

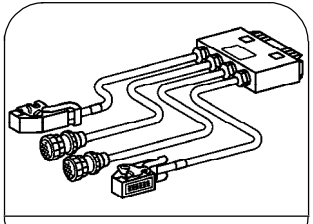
Hydraulic Test Program – Preparation for Test (Injector Test)

Special Tools



129 589 00 21 00

126-pin socket box



140 589 46 63 00

Test cable, 117-pin

Conventional tools, test equipment

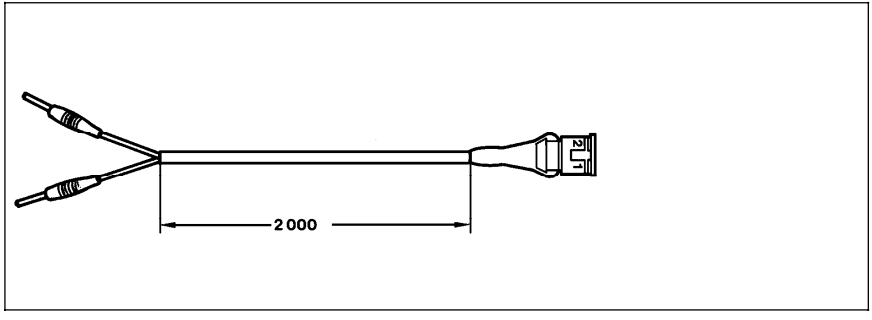
Description	Brand, model, etc.
Measuring glass (1 liter minimum)	local purchase

Hydraulic Test Program – Preparation for Test (Injector Test)

Self made harness

Consists of:

1	Connector (140 545 35 28)
2	Contact spring (004 545 56 26)
1	Banana plug (red)
1	Banana plug (black)
2.2m	Wire (red, 1.5 mm)
2.2m	Wire (brown, 1.5 mm)
2.2m	Harness tubing (6mm diameter)



Connector layout
1=red
2=brown

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Hydraulic Test Program – Test (Injector Test)

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
1.0		**Injectors** Leakage test	N3/10  26 (1.26) —(— —)— 24 (1.24)	Fuel rail and fuel injectors removed. Ignition: **ON**	Injectors must not drip.	Replace dripping injectors, ⇒ 2.0.
2.0		**Injectors** Operation and spray pattern test	N3/10  26 (1.26) —(— —)— 24 (1.24)	Ignition: **ON** Hold each injector (one after another) into a container and, using the self-made test harness, manually activate the injector by connecting harness banana plugs to socket box sockets 38 (–) and 25 (+).	Injectors must spray evenly (Figure 1).	Replace defective injectors.

Hydraulic Test Program – Test (Injector Test)

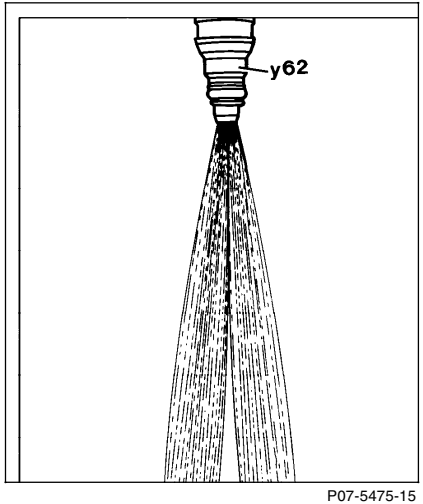

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Figure 1

Y62 Injector
Good spray pattern