9.6 Engine 120

Diagnosis - Diagnostic Trouble Code (DTC) Memory

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

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

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

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

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

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

Protective measures/guidelines

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

Continued on next page:

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

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

First-aid measures

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

To Avoid Damage to the Ignition System

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

Engine 120 has separate ignition and fuel injection system.

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

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

Diagnosis - Diagnostic Trouble Code (DTC) Memory

Note regarding diagnostic trouble code (DTC) readout:
The left (N3/11) and right engine control module (N3/12) for the ME-SFI system is equipped with diagnostic trouble code (DTC) memory. All DTC's are readable via the right control module (N3/12) only. Malfunctions are recognized and stored as DTC's and are distinguished as follows:

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

The DTC memory remains active 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 is ± 1.0 ms (injection duration)and at partial load the factor 0.77 – 1.28. After repair work is performed, the engine control module 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) upon installation of a new control module.
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 (DAS) X:
Vehicles with ME-SFI are equipped with the drive authorization system (DAS) stage 2.
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 control 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 (DAS 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 (DAS 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 “married” to one another through identification codes. The identification codes can not be erased (see HHT nominal values “DAS”, menu selection 3/7).
Therefore, swapping the engine 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 “marry” to one another. Prior to perfroming the first start, the engine control module must be version coded using the HHT. Additionally, the code number and VIN must be entered (see HHT nominal values “DAS”, menu selection 3/7).

Diagnosis - Diagnostic Trouble Code (DTC) Memory

Notes regarding automatic recognition of the mechanical end stop and wide open position of the throttle valve from the actuators:
The end stops of the throttle valves are determined by the actuators and stored in the engine control module.
After replacing one or both control modules or actuators, the mechanical end stop and wide open position must be determined and recorded.
After interrupting the voltage supply from circuit 30 (B+), the engine control module performs a self adaptation of the actuators 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, erase DTC's with HHT!

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Notes regarding activation of CHECK ENGINE MIL (only USA)

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 312.
With all other faults the MIL lights 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 > 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.

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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 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).

- **Correction program**
  The following corrections can be made with the HHT:
  (refer to HHT "Correction program" menu item)
  1. Correction of idle speed in selector lever position P/N.
  2. Correction of idle speed with selector lever in drive position.
  3. Make fault setting conditions for uneven running recognition less sensitive.

Diagnosis - Diagnostic Trouble Code (DTC) Memory

Special Tools

965 589 00 01 00

Hand-Held-Tester

965 589 00 40 00

Test cable

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Connection Diagram - Hand-Held Tester (HHT)

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

2. Ignition: **ON**

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

4. Disconnect HHT

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

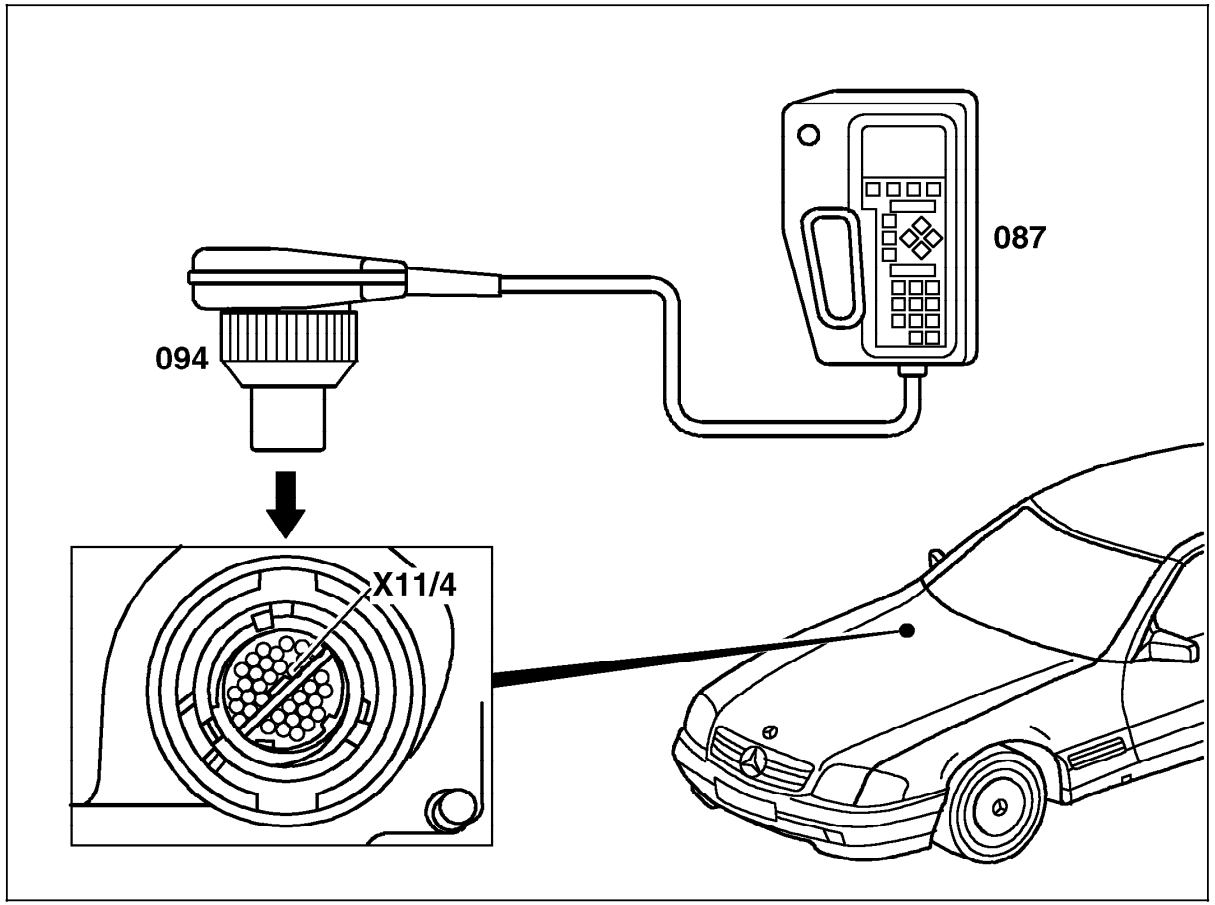

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Figure 1

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

Diagnosis – Diagnostic Trouble Code (DTC) Memory

Prerequisites for readout of DTC memory

⚠ **WARNING!**

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

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Readout via the impulse counter scan tool is not possible.

Note:

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

Preparation for Test:

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

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	Possible cause		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.
P0 100	Mass air flow circuit malfunction, bank 1 (right)	Right hot film MAF sensor (B2/7)	13 ≫ **1**	23 ⇒ 4.0
P0 105	MAP circuit malfunction, bank 1 (right)	Right pressure sensor (B28/2)	13 ≫ **2**	23 ⇒ 5.0
P0 110	IAT circuit malfunction, bank 1 (right)	Right IAT sensor (B17/6)	13 ≫ **3**	23 ⇒ 8.0
P0 115	ECT circuit malfunction, bank 1 (right)	Right ECT sensor (B11/10)	13 ≫ **4**	23 ⇒ 7.0
P0 120	Throttle position sensor circuit malfunction, bank 1 (right)	Right EA/CC/ISC actuator (M16/3) (located on left side of engine)	13 ≫ **5**	25 ⇒ 6.0
P0 130	O2S 1 circuit malfunction, bank 1 (right)	Right O2S 1 (before TWC) (G3/4)	13 ≫ **6**	23 ⇒ 10.0
P0 133	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 ⇒ 10.0

[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		
P0 135	O2S 1 heater circuit malfunction, bank 1 (right)	Right O2S 1 heater (before TWC) (G3/4)	13 ≫ **8**	23 ⇒ 11.0
P0 136	O2S 2 circuit malfunction, bank 1 (right)	Right O2S 2 (after TWC) (G3/6)	13 ≫ **6**	23 ⇒ 12.0
P0 140	O2S 1 heater circuit malfunction, bank 1 (right)	Right O2S 1 heater (before TWC) (G3/4)	13 ≫ **7**	23⇒ 10.0
P0 141	O2S 2 heater circuit malfunction, bank 1 (right)	Right O2S 2 heater (after TWC) (G3/6)	13 ≫ **8**	23⇒ 13.0
P0 150	O2S 1 circuit malfunction, bank 2 (left)	Left O2S 1 (before TWC) (G3/3)	13 ≫ **6**	23⇒ 10.0
P0 153	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⇒ 10.0
P0 155	O2S 1 heater circuit malfunction, bank 2 (left)	Left O2S 1 heater (before TWC) (G3/3)	13 ≫ **8**	23⇒ 11.0
P0 156	O2S 2 circuit malfunction, bank 2 (left)	Left O2S 2 (after TWC) (G3/5)	13 ≫ **6**	23⇒ 12.0
P0 160	O2S 1 heater circuit malfunction, bank 2 (left)	Left O2S 1 heater (before TWC) (G3/3)	13 ≫ **8**	23⇒ 10.0
P0 161	O2S 2 heater circuit malfunction, bank 2 (left)	Left O2S 2 heater (after TWC) (G3/5)	13 ≫ **8**	23⇒ 13.0

[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		
P0 170	Fuel trim malfunction, bank 1 (right)	A Self adaptation of fuel mixture “partial load“ at limit from right engine control module (N3/12). B Self adaptation of fuel mixture “CTP“ at limit from right engine control module (N3/12).	13 ⩾ **9**	Intake air leak, injectors, diaphragm pressure regulator, engine wear.
P0 173	Fuel trim malfunction, bank 2 (left)	A Self adaptation of fuel mixture “partial load“ at limit from left engine control module (N3/11). B Self adaptation of fuel mixture “CTP“ at limit from left engine control module (N3/11).	13 ⩾ **9**	Intake air leak, injectors, diaphragm pressure regulator, engine wear.
P0 201	Injector circuit malfunction - cyl. 1	Injector (Y64y1) – cylinder 1	13 ⩾ **10**	23⇒ 14.0
P0 202	Injector circuit malfunction - cyl. 2	Injector (Y64y2) – cylinder 2	13 ⩾ **10**	23⇒ 15.0
P0 203	Injector circuit malfunction - cyl. 3	Injector (Y64y3) – cylinder 3	13 ⩾ **10**	23 ⇒ 16.0
P0 204	Injector circuit malfunction - cyl. 4	Injector (Y64y4) – cylinder 4	13 ⩾ **10**	23 ⇒ 17.0
P0 205	Injector circuit malfunction - cyl. 5	Injector (Y64y5) – cylinder 5	13 ⩾ **10**	23 ⇒ 18.0
P0 206	Injector circuit malfunction - cyl. 6	Injector (Y64y6) – cylinder 6	13 ⩾ **10**	23 ⇒ 19.0
P0 207	Injector circuit malfunction - cyl. 7	Injector (Y63y7) – cylinder 7	13 ⩾ **10**	23 ⇒ 14.0
P0 208	Injector circuit malfunction - cyl. 8	Injector (Y63y8) – cylinder 8	13 ⩾ **10**	23 ⇒ 15.0
P0 209	Injector circuit malfunction - cyl. 9	Injector (Y63y9) – cylinder 9	13 ⩾ **10**	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		
P0 210	Injector circuit malfunction - cyl. 10	Injector (Y63y10) – cylinder 10	13 ≫ **10**	23 ⇒ 17.0
P0 211	Injector circuit malfunction - cyl. 11	Injector (Y63y11) – cylinder 11	13 ≫ **10**	23 ⇒ 18.0
P0 212	Injector circuit malfunction - cyl. 12	Injector (Y63y12) – cylinder 12	13 ≫ **10**	23 ⇒ 19.0
P0 300	Random misfire detected	A Random misfire B Random misfire, TWC damaging	13 ≫ **11**	Smooth running, Sensor gear adaptation, mixture adaptation, fault freeze frame data
P0 301	Cylinder 1 misfire detected	A Cylinder 1 misfire B Cylinder 1 misfire, TWC damaging	13 ≫ **11**	24 ⇒ 18.0 24 ⇒ 24.0 36 ⇒ 1.0 – 2.0 Compression pressure
P0 302	Cylinder 2 misfire detected	A Cylinder 2 misfire B Cylinder 2 misfire, TWC damaging	13 ≫ **11**	24 ⇒ 19.0 24 ⇒ 24.0 36 ⇒ 1.0 – 2.0 Compression pressure
P0 303	Cylinder 3 misfire detected	A Cylinder 3 misfire B Cylinder 3 misfire, TWC damaging	13 ≫ **11**	24 ⇒ 20.0 24 ⇒ 24.0 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		
P0 304	Cylinder 4 misfire detected	A Cylinder 4 misfire B Cylinder 4 misfire, TWC damaging	13 ⩾ **11**	24 ⇒ 21.0 24 ⇒ 24.0 36 ⇒ 1.0 – 2.0 Compression pressure
P0 305	Cylinder 5 misfire detected	A Cylinder 5 misfire B Cylinder 5 misfire, TWC damaging	13 ⩾ **11**	24 ⇒ 22.0 24 ⇒ 24.0 36 ⇒ 1.0 – 2.0 Compression pressure
P0 306	Cylinder 6 misfire detected	A Cylinder 6 misfire B Cylinder 6 misfire, TWC damaging	13 ⩾ **11**	24 ⇒ 23.0 24 ⇒ 24.0 36 ⇒ 1.0 – 2.0 Compression pressure
P0 307	Cylinder 7 misfire detected	A Cylinder 7 misfire B Cylinder 7 misfire, TWC damaging	13 ⩾ **11**	24 ⇒ 18.0 24 ⇒ 24.0 36 ⇒ 1.0 – 2.0 Compression pressure
P0 308	Cylinder 8 misfire detected	A Cylinder 8 misfire B Cylinder 8 misfire, TWC damaging	13 ⩾ **11**	24 ⇒ 19.0 24 ⇒ 24.0 36 ⇒ 1.0 – 2.0 Compression pressure
P0 309	Cylinder 9 misfire detected	A Cylinder 9 misfire B Cylinder 9 misfire, TWC damaging	13 ⩾ **11**	24 ⇒ 20.0 24 ⇒ 24.0 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		
P0 310	Cylinder 10 misfire detected	A Cylinder 10 misfire B Cylinder 10 misfire, TWC damaging	13 ⩾ **11**	24 ⇒ 21.0 24 ⇒ 24.0 36 ⇒ 1.0 – 2.0 Compression pressure
P0 311	Cylinder 11 misfire detected	A Cylinder 11 misfire B Cylinder 11 misfire, TWC damaging	13 ⩾ **11**	24 ⇒ 22.0 24 ⇒ 24.0 36 ⇒ 1.0 – 2.0 Compression pressure
P0 312	Cylinder 12 misfire detected	A Cylinder 12 misfire B Cylinder 12 misfire, TWC damaging	13 ⩾ **11**	24 ⇒ 23.0 24 ⇒ 24.0 36 ⇒ 1.0 – 2.0 Compression pressure
P0 325	KS 1 circuit malfunction (right front)	Right KS 1 (A30g1)	13 ⩾ **12**	Wiring, connector, A30 g1
P0 330	KS 2 circuit malfunction (right rear)	Right KS 2 (A30g2)	13 ⩾ **12**	Wiring, connector, A30 g2
P0 335	CKP sensor circuit malfunction, bank 1 (right)	Right CKP sensor (L5/5)	13 ⩾ **13**	24 ⇒ 10.0

[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		
P0 341	CMP sensor circuit range/performance, bank1 (right)	Right camshaft Hall-effect sensor (B6/3)	13 ≫ **14**	24 ⇒ 11.0
P0 410	AIR injection system malfunction	AIR system malfunction (logic chain)	13 ≫ **15**	23 ⇒ 20.0 – 21.0 Hose disconnected from actuator.
P0 422	TWC efficiency below threshold, right	Right TWC efficiency below threshold	13 ≫ **16**	Replace right TWC
P0 432	TWC efficiency below threshold, left	Left TWC efficiency below threshold	13 ≫ **16**	Replace left TWC
P0 440 **Only (USA) Model 140, Model 129 as of 09/97**	EVAP system malfunction	EVAP malfunction (logic chain)	13 ≫ **17**	23 ⇒ 24.0 – 26.0
P0 441	EVAP system incorrect purge flow	Right EVAP system malfunction	13 ≫ **18**	23 ⇒ 24.0 – 25.0
P0 442 **Only (USA) Model 140, Model 129 as of 09/97**	EVAP system leak detected (small leak)	EVAP system, small leak	13 ≫ **17**	23 ⇒ 26.0
P0 443	EVAP system purge control valve circuit malfunction, bank 1 (right)	Right purge control valve (Y58/3)	13 ≫ **19**	23 ⇒ 24.0
P0 446 **Only (USA) Model 140, Model 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 ⇒ 24.0, 26.0 23 ⇒ 28.0 23 ⇒ 27.0

[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		
P0 450	**Only USA Model 140, Model 129 as of 09/97**	EVAP system pressure sensor malfunction	Fuel tank pressure sensor (B4/3)	13 ⩾ **21**	23 ⇒ 28.0 Charcoal canister plugged.
	Only USA Model 129 up to 09/97		Purge monitoring pressure sensor (B4/4)	13 ⩾ **22**	23 ⇒ 29.0
P0 455	**Only USA Model 140, Model 129 as of 09/97**	EVAP system leak detected (large leak)	EVAP system, large leak, Fuel tank pressure sensor (B4/3)	13 ⩾ **17**	23 ⇒ 26.0 23 ⇒ 28.0
P0 462		Fuel level sensor circuit low input	Fuel tank level too low		Fill fuel tank
P0 500		VSS sensor malfunction	A VSS left front B VSS left rear	13 ⩾ **23**	25 ⇒ 8.0 25 ⇒ 9.0
P0 507		ISC rpm higher than expected	Idle control system	13 ⩾ **24**	25 ⇒ 4.0, 5.0, 10.0
P0 560		System voltage malfunction	Voltage supply to right engine control module (N3/12)	13 ⩾ **25**	23 ⇒ 1.0 – 3.0
P0 565		Cruise control switch	CC switch (S40)		26 ⇒ 1.0
P0 600		Serial communication link malfunction	CAN bus from ESP/SPS control module (N47-5)	13 ⩾ **26**	23 ⇒ 30.0

[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		
P0 604	Internal control module random Access memory (RAM) error	A Engine control module left (N3/11) or right (N3/12) B Engine control module left (N3/11) or right (N3/12)		(N3/11) or (N3/12)
P0 605	Internal control module random Access memory (RAM) error	Engine control module left (N3/11) or right (N3/12)		(N3/11) or (N3/12)
P0 700	Transmission control system malfunction Gear unplausi, transmission leak, Command sleeve stuck in pressure pos.	Read DTC memory of transmission control module DTC description DTC description	13 ⩾ **27** 13 ⩾ **28**	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.
P0 702	Transmission control system electrical Voltage supply to solenoid valves	Read DTC memory of transmission control module DTC description	13 ⩾ **29** 13 ⩾ **30**	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.
P0 715	Input/turbine speed sensor circuit malfunction RPM sensor voltage supply and function	Read DTC memory of transmission control module DTC description	13 ⩾ **31**	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.
P0 720	Output speed sensor circuit malfunction CAN fault recognition	Read DTC memory of transmission control module DTC description	13 ⩾ **32**	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.
P0 730	Incorrect gear ratio Ratio comparison negative (numerous)	Read DTC memory of transmission control module DTC description	13 ⩾ **33**	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		
P0 740	Torque converter clutch system malfunction	Read DTC memory of transmission control module DTC description	13 ≫ **34**	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.
P0 743	Torque converter clutch system electrical	Read DTC memory of transmission control module DTC description	13 ≫ **35**	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.
P0 748	Pressure control solenoid electrical Pressure control valve modulation press. Pressure control valve shift pressure	Read DTC memory of transmission control module DTC description DTC description	13 ≫ **36** 13 ≫ **37**	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.
P0 753	Shift solenoid A electrical 1-2/4-5 solenoid shift valve	Read DTC memory of transmission control module DTC description	13 ≫ **38**	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.
P0 758	Shift solenoid B electrical 2-3 solenoid shift valve	Read DTC memory of transmission control module DTC description	13 ≫ **39**	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.
P0 763	Shift solenoid C electrical 3-4 solenoid shift valve	Read DTC memory of transmission control module DTC description	13 ≫ **40**	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.
P0 809	Angle deviation between camshaft and crankshaft	Angle deviation between camshaft and crankshaft		Check basic adjustment of camshaft

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	Possible cause		DTC Description	Test step/Remedy [1]
	SAE nomenclature	Explanation		
P1 146	Mass air flow circuit malfunction, bank 2 (left) Left hot film MAF sensor (B2/6)	Left hot film MAF sensor (B2/6) DTC description	13 ≫ **1**	23 ⇒ 4.0
P1 147	ECT circuit malfunction, bank 2 (left) Left ECT sensor	Left ECT sensor (B11/9) DTC description	13 ≫ **4**	23 ⇒ 7.0
P1 148	IAT circuit malfunction, bank 2 (left) Left IAT sensor	Left IAT sensor (B17/5) DTC description	13 ≫ **3**	23 ⇒ 8.0
P1 149	MAP circuit malfunction, bank 2 (left) Left pressure sensor	Left pressure sensor (B28/1) DTC description	13 ≫ **2**	23 ⇒ 5.0
P1 162	Throttle position sensor circuit malfunction, bank 2 (left) Left EA/CC/ISC actuator actual value potentiometer	Left EA/CC/ISC actuator actual value potentiometer (M16/4r1, M16/4r2) DTC description	13 ≫ **5**	25 ⇒ 6.0
P1 163	Oil level switch	Oil level switch (S43)		23 ⇒ 31.0
P1 177	Oil temperature	Oil temperature sensor (B1)		23 ⇒ 32.0
P1 186	Fuel safety shut-off recognized	EA/CC/ISC actuator (M16/6)		25 ⇒ 6.0 – 7.0, EA/CC/ISC actuator (M16/6) sticks or jammed, Check intake system for residue.

[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 300	CKP sensor circuit malfunction, bank 2 (left) Left CKP sensor	Left CKP sensor (L5/4) DTC description	13 ⩾ **13**	24 ⇒ 10.0
P1 384	KS 1 circuit malfunction (left front) Left knock sensor 1	Left knock sensor 1 (A29g1) DTC description	13 ⩾ **12**	Wiring, connector, A29g1
P1 385	KS 2 circuit malfunction (left rear) Left knock sensor 2	Left knock sensor 2 (A29g2) DTC description	13 ⩾ **12**	Wiring, connector, A29g2
P1 386	Knock sensor control from ECM (N3/12) at end stop Knock sensor regulation	Knock sensor regulation from right engine control module (N3/12) hardware failure DTC description	13 ⩾ **41**	1. Increased knock tendency due to bad fuel, carbon in combustion chamber or mechanical damage. 2. Engine control module (N3/12)
P1 397	CMP sensor circuit range/performance, bank 2 (left) Left camshaft Hall-effect sensor	Left camshaft Hall-effect sensor (B6/2) DTC description	13 ⩾ **14**	24 ⇒ 11.0
P1 420	AIR pump switchover valve AIR pump switchover valve	AIR pump switchover valve (Y32) DTC description	13 ⩾ **42**	23 ⇒ 21.0
P1 443	EVAP system malfunction Left EVAP system malfunction	Left EVAP system malfunction DTC description	13 ⩾ **18**	23 ⇒ 24.0 – 25.0
P1 453	AIR relay module AIR relay module	AIR relay module (K17) DTC description	13 ⩾ **42**	23 ⇒ 20.0

[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 463	Left AIR system malfunction Left AIR system malfunction	Left AIR system malfunction DTC description	13 ⩾ **15**	23 ⇒ 20.0 – 21.0 Hose disconnected from actuator.
P1 490	EVAP system purge control valve circuit malfunction, bank 2 (left) Left purge control valve	Left purge control valve (Y58/2) DTC description	13 ⩾ **19**	23 ⇒ 24.0
P1 519	Right adjustable camshaft timing solenoid Right adjustable camshaft timing solenoid	Right adjustable camshaft timing solenoid (Y49/2) (logic chain) DTC description	13 ⩾ **43**	23 ⇒ 22.0– 23.0
P1 522	Left adjustable camshaft timing solenoid Left adjustable camshaft timing solenoid	Left adjustable camshaft timing solenoid (Y49/1) (logic chain) DTC description	13 ⩾ **43**	23 ⇒ 22.0 – 23.0
P1 525	Right adjustable camshaft timing solenoid Right adjustable camshaft timing solenoid	Right adjustable camshaft timing solenoid (Y49/2) DTC description	13 ⩾ **44**	23 ⇒ 22.0 – 23.0
P1 533	Left adjustable camshaft timing solenoid Left adjustable camshaft timing solenoid	Left adjustable camshaft timing solenoid (Y49/1) DTC description	13 ⩾ **44**	23 ⇒ 22.0 – 23.0
P1 542	Pedal value sensor Pedal value sensor	Pedal value sensor (B37) DTC description	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	CAN signal from DAS control module to right engine control module (N3/12)	CAN signal from DAS control module (N54/1) to right engine control module (N3/12) interrupted.		23 ⇒ 30.0
P1 580	Right EA/CC/ISC actuator Right EA/CC/ISC actuator	Right EA/CC/ISC actuator (M16/3) DTC description	13 ≫ **46**	25 ⇒ 7.0
P1 581	Left EA/CC/ISC actuator Left EA/CC/ISC actuator	Left EA/CC/ISC actuator (M16/4) DTC description	13 ≫ **46**	25 ⇒ 7.0
P1 584	Stop lamp switch	Stop lamp switch (S9/1)		26 ⇒ 1.0
P1 587	Left engine control module voltage supply Left engine control module	Left engine control module (N3/11) voltage supply DTC description	13 ≫ **25**	23 ⇒ 1.0 – 3.0
P1 588	CAN signal from RCL control module to left engine control module	CAN signal from RCL to left engine control module (N3/11)		23 ⇒ 30.0
P1 589	Knock sensor control from left engine control module at end stop Left engine control module (N3/11) hardware failure	Knock sensor regulation from left engine control module (N3/11) hardware failure DTC description	13 ≫ **41**	1. Increased knock tendency due to bad fuel, carbon in combustion chamber or mechanical damage. 2. Engine control module (N3/11)

[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 605	Body acceleration sensor (up to 06/96) Body acceleration sensor	Body acceleration sensor (B24) (up to 06/96) DTC description Poor road/traction condition recognition signal (via comparison of VSS rpm signals) (as of 06/96)	13 ≫ **47**	23 ⇒ 36.0 Test ASR/ESP see DM, Chassis and Drivetrain, Vol. 3, Section 9, 10
P1 632	Engine control module	Left engine control module (N3/11)		(N3/11)
P1 641	Engine control module CAN bus interrupted	A. Right CTP signal implausible B. Left CTP signal implausible C. CAN signal to left engine control module (N3/11) interrupted DTC description	13 ≫ **26**	25 ⇒ 10.0, 25 ⇒ 10.0, 23 ⇒ 30.0
P1 747	CAN signal from ETC CAN bus interrupted	CAN signal from ETC (N15/3) DTC description	13 ≫ **26**	23 ⇒ 30.0

[1] Observe Preparation for Test, see 22.

Diagnosis – Complaint Related Diagnostic Chart – Injection/Ignition

⚠ WARNING!

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

Preparation for Test:

1. Review 11, 21, 22, 23, 24, 31, 33

Complaint/Problem	Possible cause	Test step/Remedy [1]	Actual value Engine test Menu item
Engine starts and accelerates poorly when cold	Injector (Y62) control and injection duration. Hot film MAF sensor (B2/6 or B2/7). ECT sensor (B11/9 or B11/10). Ignition voltage too low. Intake air leak.	23 ⇒ 14.0 – 19.0 23 ⇒ 4.0 23 ⇒ 7.0 24 ⇒ 24.0 Remedy leak.	2/7 1/7 3/7 – –
Engine does not start	No voltage supply from base module (N16/1). Malfunction of drive authorization system (DAS) . Fuel pumps defective. No compression, oil pressure too high. Ignition voltage too low.	23 ⇒ 1.0 – 3.0 23 ⇒ 30.0 34 ⇒ 2.0 Check compression and oil pressure. 24 ⇒ 24.0	– DAS 1/1 – – –
Engine has uneven idle	Camshaft timing. Injector (Y62) control and injection duration. Intake air leak.	23 ⇒ 22.0 – 23.0 23 ⇒ 14.0 – 19.0 Remedy leak.	2/7 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 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 ⇒ 10.0 – 11.0	5/7
	ECT sensor (B11/9 or B11/10).	23 ⇒ 7.0	3/7
	Hot film MAF sensor (B2/6 or B2/7).	23 ⇒ 4.0	1/7
	Camshaft timing.	23 ⇒ 22.0 – 23.0	2/7
Engine runs unevenly (shakes)	Injector (Y62) control and injection duration.	23 ⇒ 14.0 – 19.0	2/7
	Injector leaking, spray pattern.	36 ⇒ 1.0	–
	Left or right O2S 1 (G3/3 or G3/4) (before TWC).	23 ⇒ 10.0 – 11.0	5/7
	Ignition voltage too low.	24 ⇒ 24.0	–
	Compression on one or more cylinders too low.	Check compression.	–
	Intake air leak.	Remedy leak.	–
Engine runs unevenly (misfiring)	Ignition voltage too low.	24 ⇒ 24.0	–
	Hot film MAF sensor (B2/6 or B2/7).	23 ⇒ 4.0	1/7
Engine surges after cold start	Intake air leak.	Remedy leak.	–
Transition failure during warm-up	ECT sensor (B11/9 or B11/10).	23 ⇒ 7.0	3/7
	Hot film MAF sensor (B2/6 or B2/7).	23 ⇒ 4.0	1/7
	Intake air leak.	Remedy leak.	–
Transition failure when warm or with increased fuel consumption	Left or right O2S 1 (G3/3 or G3/4) (before TWC).	23 ⇒ 10.0 – 11.0	5/7
	Purge control valve (Y58/2 or Y58/3) stuck in open position.	23 ⇒ 24.0 – 25.0	3/7

[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 vibrates	Hot film MAF sensor (B2/6 or B2/7). Ignition voltage too low. Left or right O2S 1 (G3/3 or G3/4) (before TWC).	23 ⇒ 4.0 24 ⇒ 24.0 23 ⇒ 10.0 – 11.0	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 (B2/6, B2/7)
1	OBD trouble code	P0100 Right cylinder bank P1146 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	Hot film MAF sensor signal threshold values
5	Lower threshold value Upper threshold value Plausibility Test duration per threshold value	approx. 0.2 V approx. 5.4 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, B28/2)
1	OBD trouble code	P0105 Right cylinder bank P1149 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	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 (B17/5, B17/6)
1	OBD trouble code	P0110 Right cylinder bank P1148 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	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	i	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 (B11/9, B11/10)
1	OBD trouble code	P0115 Right cylinder bank P1147 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	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.
6	i	In case of a fault driving continues with the substitude value from the temperature pattern. If the signal is plausible again, a switchover to the signal of the ECT sensor occurs.

Diagnosis – Trouble Code Description

≫ 5		Actual value potentiometer in EA/CC/ISC actuator (M16/3, M16/4)
1	OBD trouble code	P0120 Right cylinder bank P1162 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	Threshold value of actual value potentiometers r1 or r2
5	Reference potentiometer r1 Lower threshold value Upper threshold value Actual value potentiometer r2 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) P0140 Right O2S 1 heater (before TWC) (G3/4) P0150 Left O2S 1 (before TWC) (G3/3) P0156 Left O2S 2 (after TWC) (G3/5) P0160 Left 02S 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. 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	i	All electrical 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. 7.5 seconds (average value from 9 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 to 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	i	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. 4.4 Ω (corresponds to approx. 2.7 A at 12 V) > approx. 18.4 Ω (corresponds to approx. 0.65 A at 12 V)
6	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 (N3/11, N3/12)** **B. Self adaptation of fuel mixture "CTP" at limit from engine control module (N3/11, N3/12)**
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	i	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 – P0212
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/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	i	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.
7	(!)	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 – P0312 Misfire, assigned to each 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 (illuminated) after two consecutive trips with fault **B. Misfire "TWC damaging"** Ignition misfire within 200 engine revolutions. CHECK ENGINE MIL is activated (illuminated via 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. > 20 misfires within 1000 engine revolutions B. > 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	i	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 of cylinders the CHECK ENGINE MIL changes from blinking to continuous illumination 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
1	OBD trouble code	P0325 Right KS 1 (A30g1) P0330 Right KS 2 (A30g2) P1384 Left KS 1 (A29g1) P1385 Left KS 2 (A29g2)
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	i	The safety retard adjustment occurs on all cylinders in case of a fault.

Diagnosis – Trouble Code Description

≫ 13		CKP sensor (L5/4, L5/5)
1	OBD trouble code	P0335 Right cylinder bank P1300 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	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 (B6/2, B6/3)
1	OBD trouble code	P0341 Right cylinder bank P1397 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	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 Right cylinder bank P1463 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	Once per trip
4	Checked signal or condition	O_2 sensor signal before TWC
5	Threshold value Test duration	Lambda control factor approx. 25% (lean mixture recognized, engine control module at "rich" stop) < 15 seconds
6	Prerequisite for test	– Engine at CTP (idle) – Vehicle stationary – 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 ageing – 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. 8,000 ft altitude) – Engine coolant temperature < approx. 90°C – Lambda control released
7	Test sequence	With the start of the logic chain all functions for the automatic mixture adaptation are blocked, the purge switchover valves are 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%.
8	i	If a prerequisite changes during the test, the test is canceled and started later again.

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	i	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) Only (USA) Model 140 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 stationary – 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. 8,000 ft 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	i	With defective fuel tank pressure sensor DTC P0455 is displayed

Diagnosis – Trouble Code Description

≫ 18		EVAP not functioning
1	OBD trouble code	P0441 Right cylinder bank P1443 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	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. 27 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 Right cylinder bank P1490 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	Once per trip
4	Checked signal or condition	Voltage and current at respective 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		Only (USA) Model 140 only, Model 129 as of 09/97 A. Charcoal canister shut-off valve, output stage B. Charcoal canister shut-off valve (Y58/4)
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	i	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		Only (USA) Model 140 only, Model 129 as of 09/97 **Fuel tank pressure sensor (B4/3)**
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 **B.** Lower threshold value Upper 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 approx. 0.27 V approx. 4.9 V < 5 seconds
6	Prerequisite for test	The time purge system is inoperative after starting engine has elapsed (approx. 10 seconds)
7	i	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

Diagnosis – Trouble Code Description

≫ 22		Only (USA) Model 129 up to 08/97 **Purge monitoring pressure sensor (B4/4)**
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 **B.** Lower threshold value Upper 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 approx. 0.27 V approx. 4.9 V < 5 seconds
6	Prerequisite for test	The time purge system is inoperative after starting engine has elapsed (approx. 10 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. 7 mp/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 – Load > approx. 40% – Transmission range D
7	i	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 stationary

Diagnosis – Trouble Code Description

≫ 25		Voltage supply to engine control module (N3/10)
1	OBD trouble code	P0560 for right cylinder bank P1587 for 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	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 has elapsed

Diagnosis – Trouble Code Description

≫ 26		CAN bus interrupted
1	OBD trouble code	P0600 CAN from ESP control module P1641 CAN to left engine control module (N3/11) 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	Test duration	< 15 seconds
5	i	The data exchange between the control modules is monitored via the CAN element in the engine control module (ME-SFI).

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	i	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 (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	i	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 (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	i	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	i	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 (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	i	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 (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	The ETC control module monitors the wheel rpm signal from the EPS control module via CAN data bus for plausibility.
5	Test duration	< 1 second
6	i	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 (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	i	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 (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	i	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 (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	i	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 (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, modulation pressure
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 approx. 1 second
6	i	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 (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, shift pressure
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 approx. 1 second
6	i	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 (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 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 approx. 1 second
6	i	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 (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 Short 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 approx. 1 second
6	i	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 (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 Short 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 approx. 1 second
6	i	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.

Diagnosis – Trouble Code Description

≫ 41		Knock sensor control in engine control module (N3/10) hardware failure
1	OBD trouble code	P1386 for right cylinder bank P1589 for 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	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	i	Failure must occur at least 10 times

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	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.
8	i	If a prerequisite changes during the test, the test is interrupted and restarted later.

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	i	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 Right cylinder bank P1581 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 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 until 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 stationary – Delay time of approx. 2 seconds elapsed

Electrical Test Program – Component Locations

Components on engine
Model 129

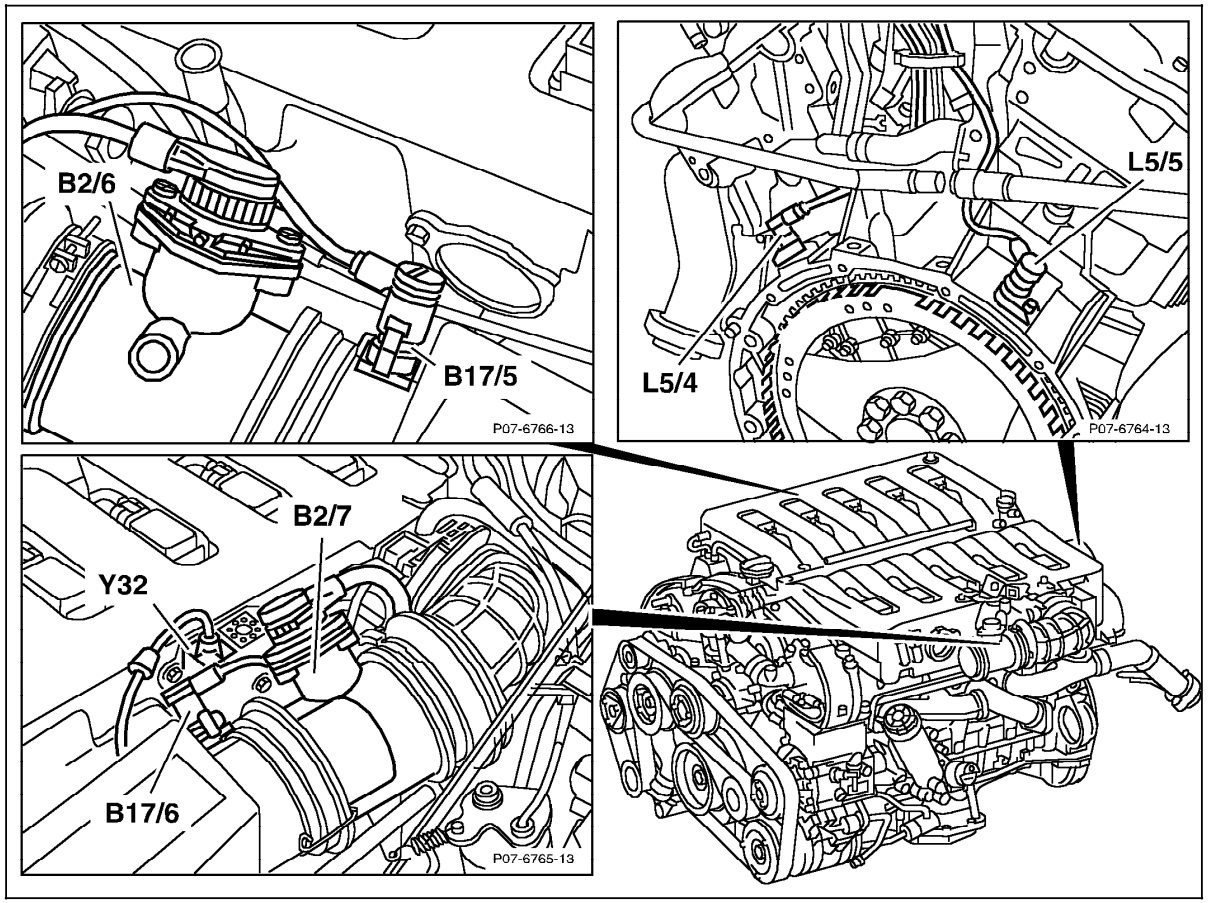

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Figure 1

B2/6	Left hot film MAF sensor (located on right side of engine)
B2/7	Right hot film MAF sensor (located on left side of engine)
B17/5	Left IAT sensor (located in engine compartment, right hand side)
B17/6	Right IAT sensor (located in engine compartment, left hand side)
L5/4	Left CKP sensor
L5/5	Right CKP sensor
Y32	AIR pump switchover valve

Electrical Test Program – Component Locations

Components on engine
Model 129

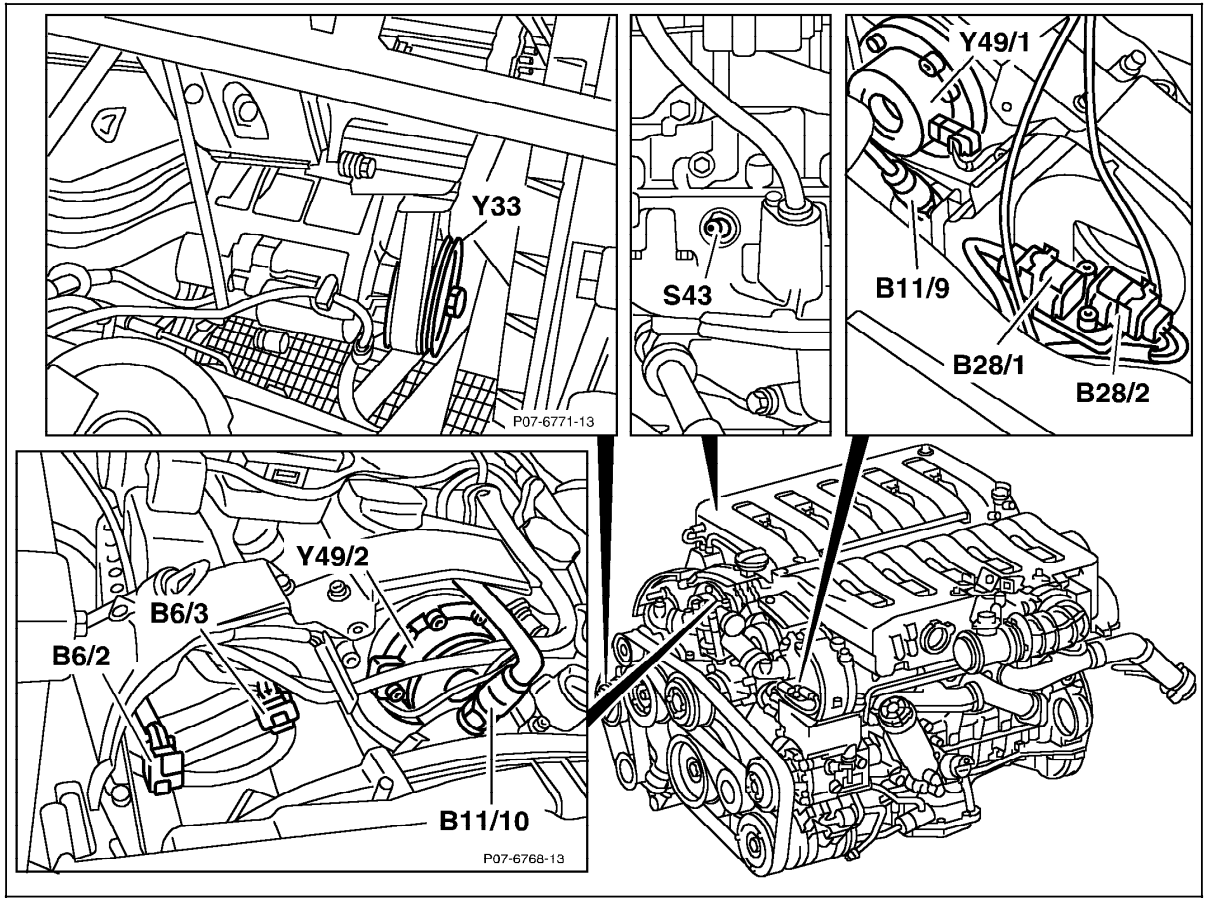

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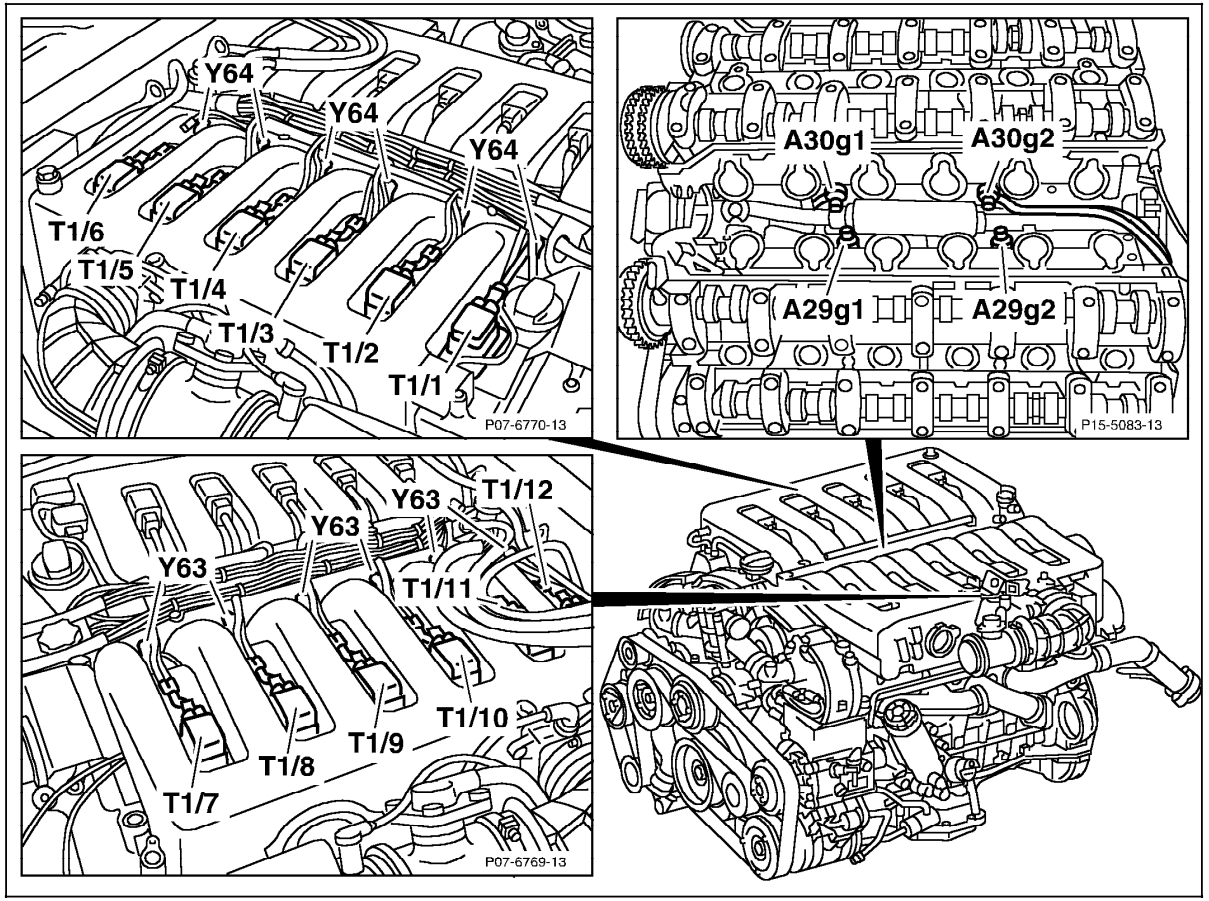
Figure 2

B6/2	Left camshaft Hall-effect sensor
B6/3	Right camshaft Hall-effect sensor
B11/9	Left ECT sensor
B11/10	Right ECT sensor
B28/1	Left pressure sensor (only USA)
B28/2	Right pressure sensor (only USA)
S43	Oil level switch
Y33	Electromagnetic AIR pump clutch
Y49/1	Left adjustable camshaft timing solenoid
Y49/2	Right adjustable camshaft timing solenoid

Electrical Test Program – Component Locations

Components on engine
Model 129



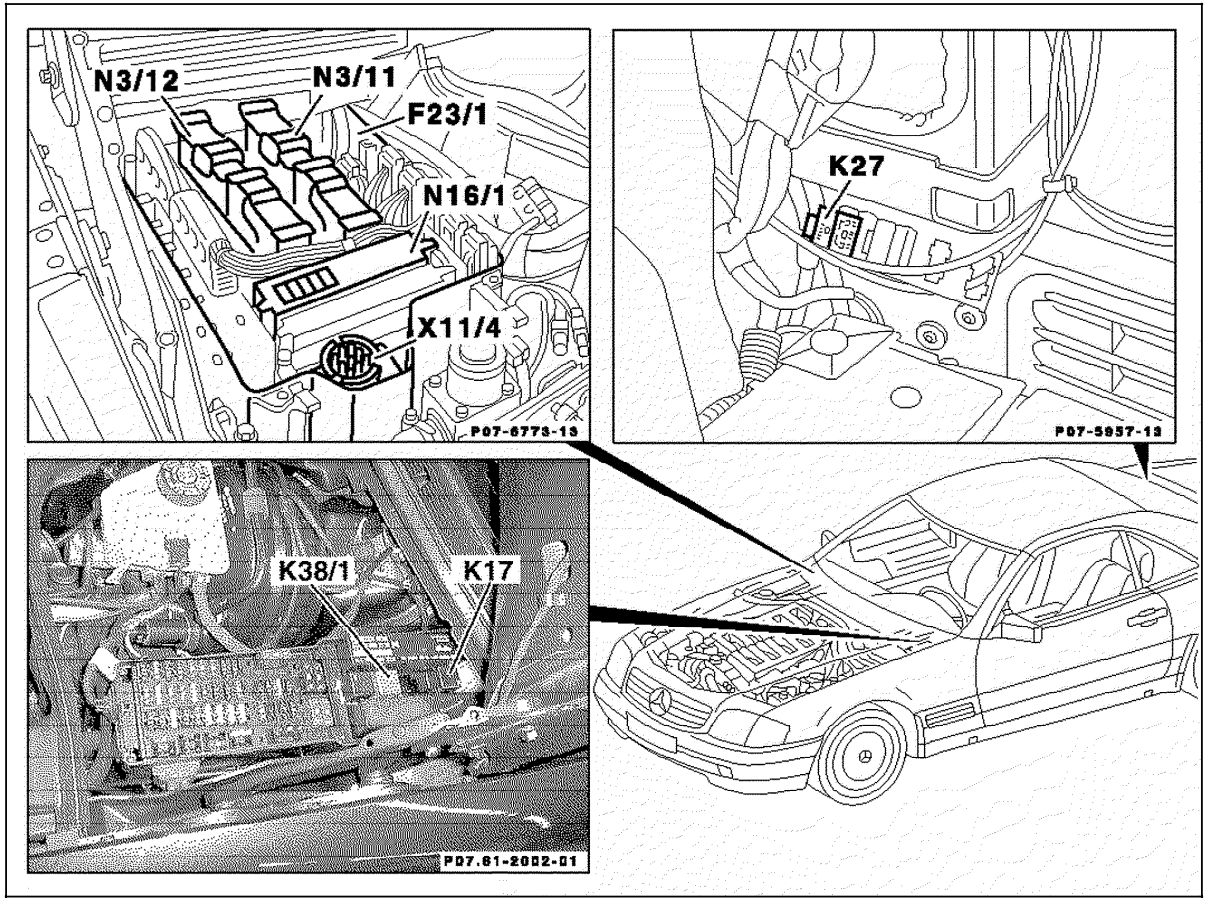
P07.61-2053-06

Figure 3

A29g1	Left knock sensor 1
A29g2	Left knock sensor 2
A30g1	Right knock sensor 1
A30g2	Right knock sensor 2
T1/1	Ignition coil cylinder 1
T1/2	Ignition coil cylinder 2
T1/3	Ignition coil cylinder 3
T1/4	Ignition coil cylinder 4
T1/5	Ignition coil cylinder 5
T1/6	Ignition coil cylinder 6
T1/7	Ignition coil cylinder 7
T1/8	Ignition coil cylinder 8
T1/9	Ignition coil cylinder 9
T1/10	Ignition coil cylinder 10
T1/11	Ignition coil cylinder 11
T1/12	Ignition coil cylinder 12
Y63	Left injectors
Y64	Right injectors

Electrical Test Program – Component Locations

Engine Compartment
Model 129



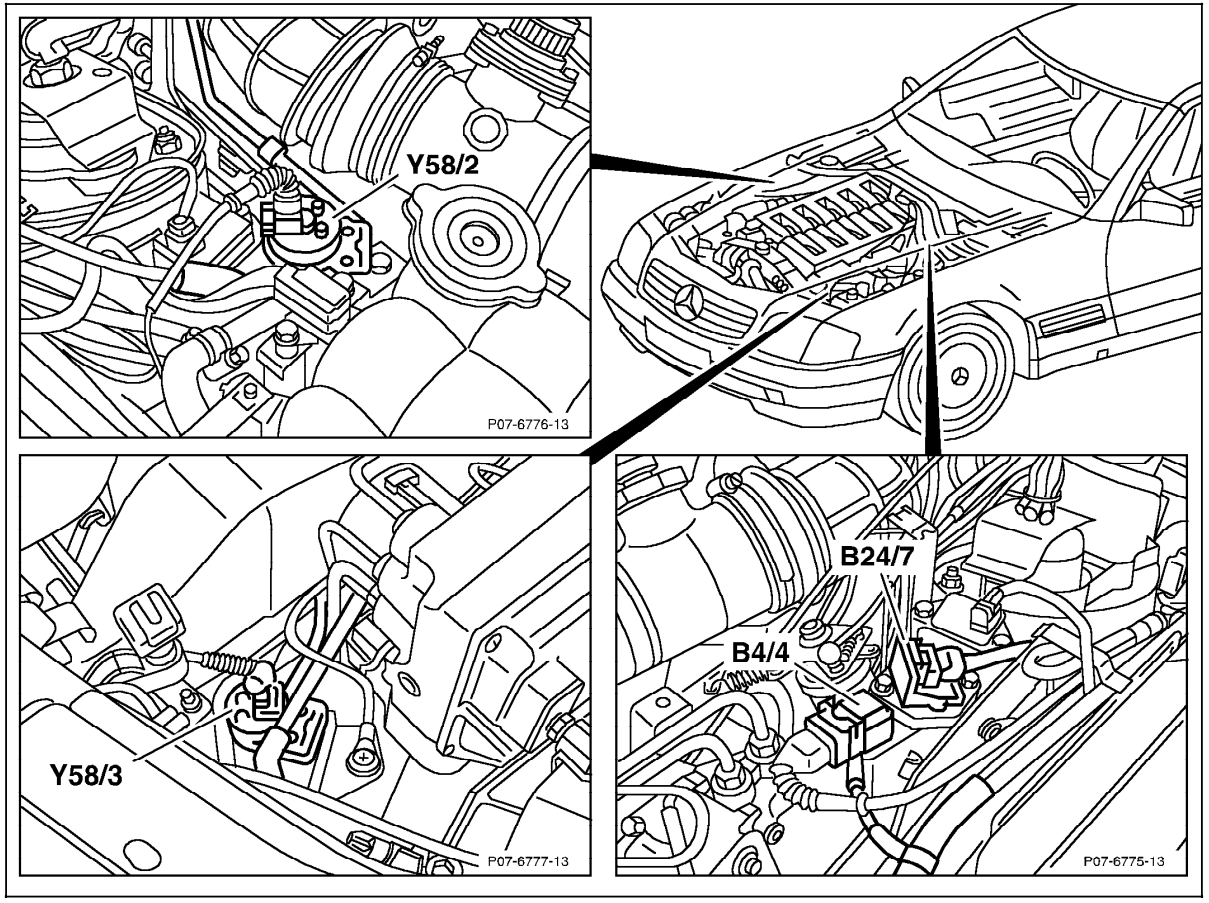
P07.61-2017-06

Figure 4

F23/1 Control module box
K17 AIR relay module
K27 FP relay module
K38/1 Starter lock-out relay module
N3/11 Left engine control module (ME-SFI)
N3/12 Right engine control module (ME-SFI)
N16/1 Base module
X11/4 Data link connector (DTC readout)

Electrical Test Program – Component Locations

Engine Compartment
Model 129



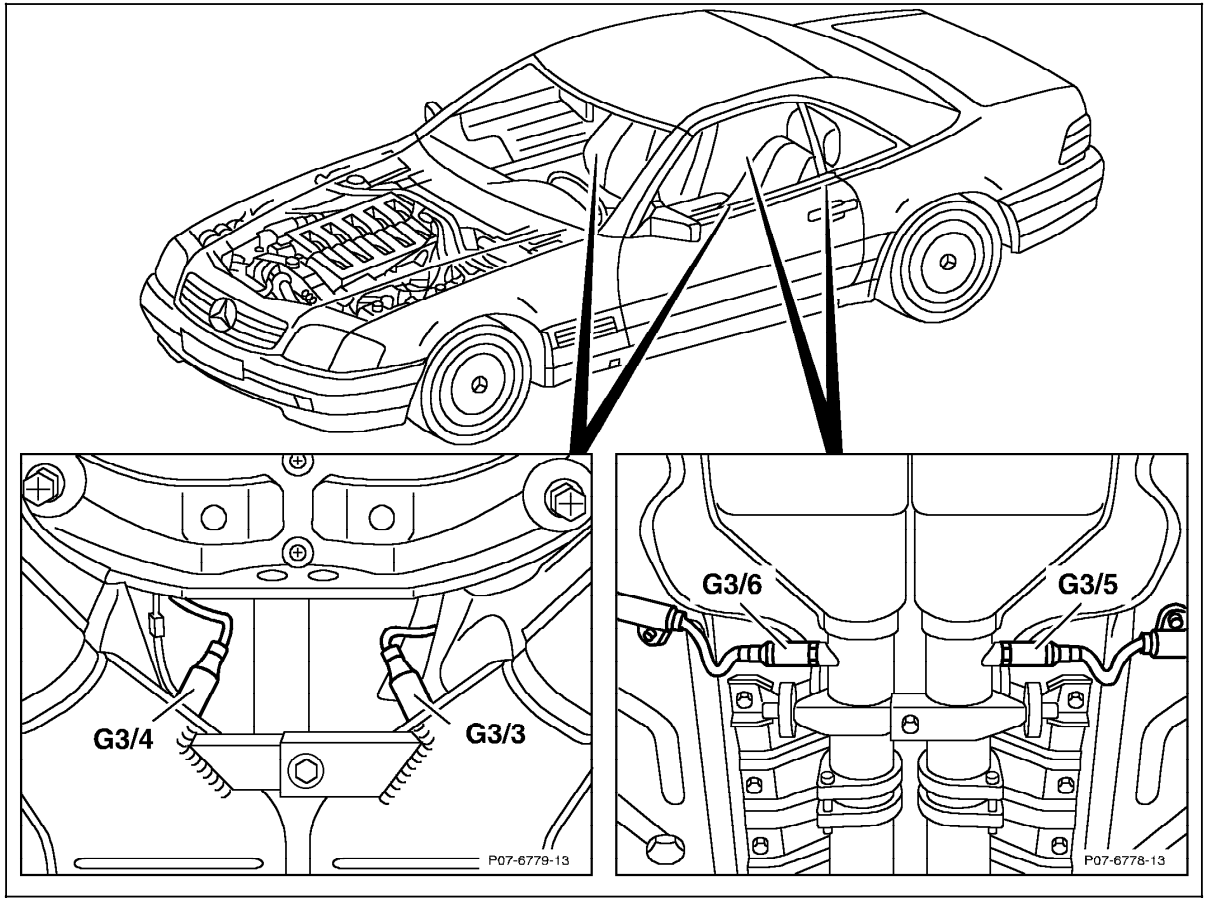
P07.61-2055-06

Figure 5

B4/4 Purge control pressure sensor (only USA, up to 08/97)
B24/7 Body acceleration sensor (only up to 05/97)
Y58/2 Left purge control valve (located in engine compartment, right hand side)
Y58/3 Right purge control valve (located in engine compartment, left hand side)

Electrical Test Program – Component Locations

Engine Compartment
Model 129



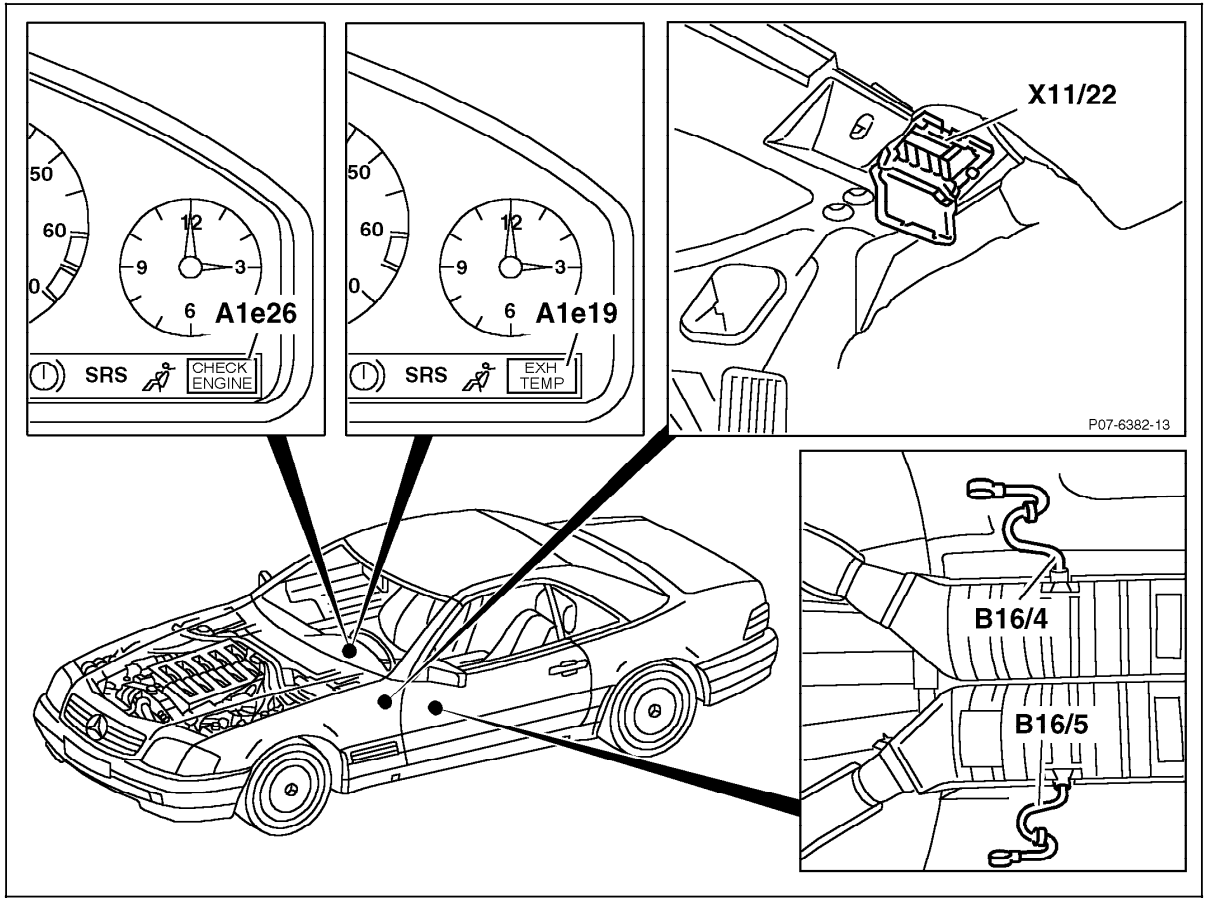
P07.61-2057-06

Figure 6

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



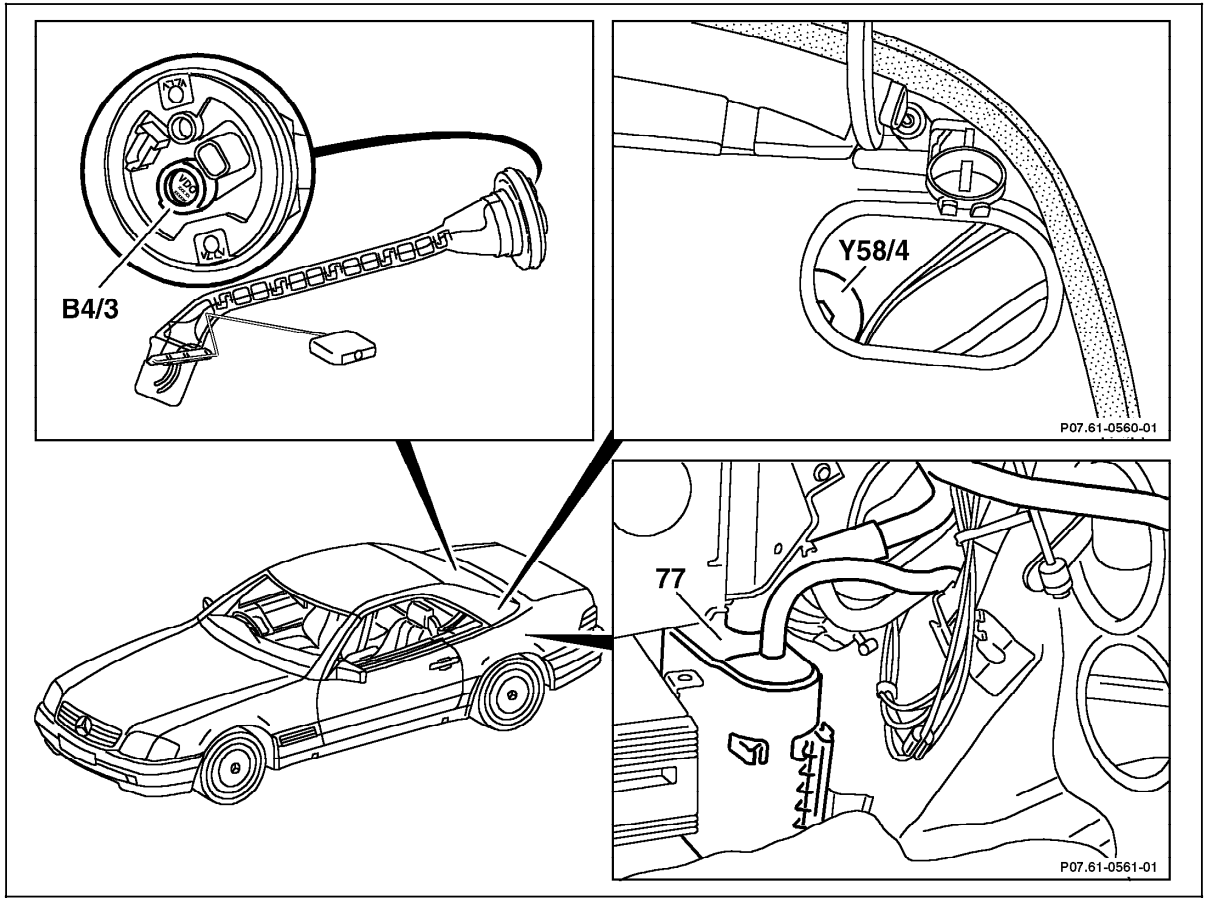
P07.61-0228-06

Figure 7

A1e19 Catalytic converter overheat warning lamp (J up to 05/96)
A1e26 "CHECK ENGINE" MIL (only USA)
B16/4 Left exhaust gas temperature sensor (J up to 05/96)
B16/5 Right exhaust gas temperature sensor (J up to 05/96)
X11/22 Diagnostic module (OBD II) generic scan tool connector (only USA)

Electrical Test Program – Component Locations

Trunk Compartment
Model 129



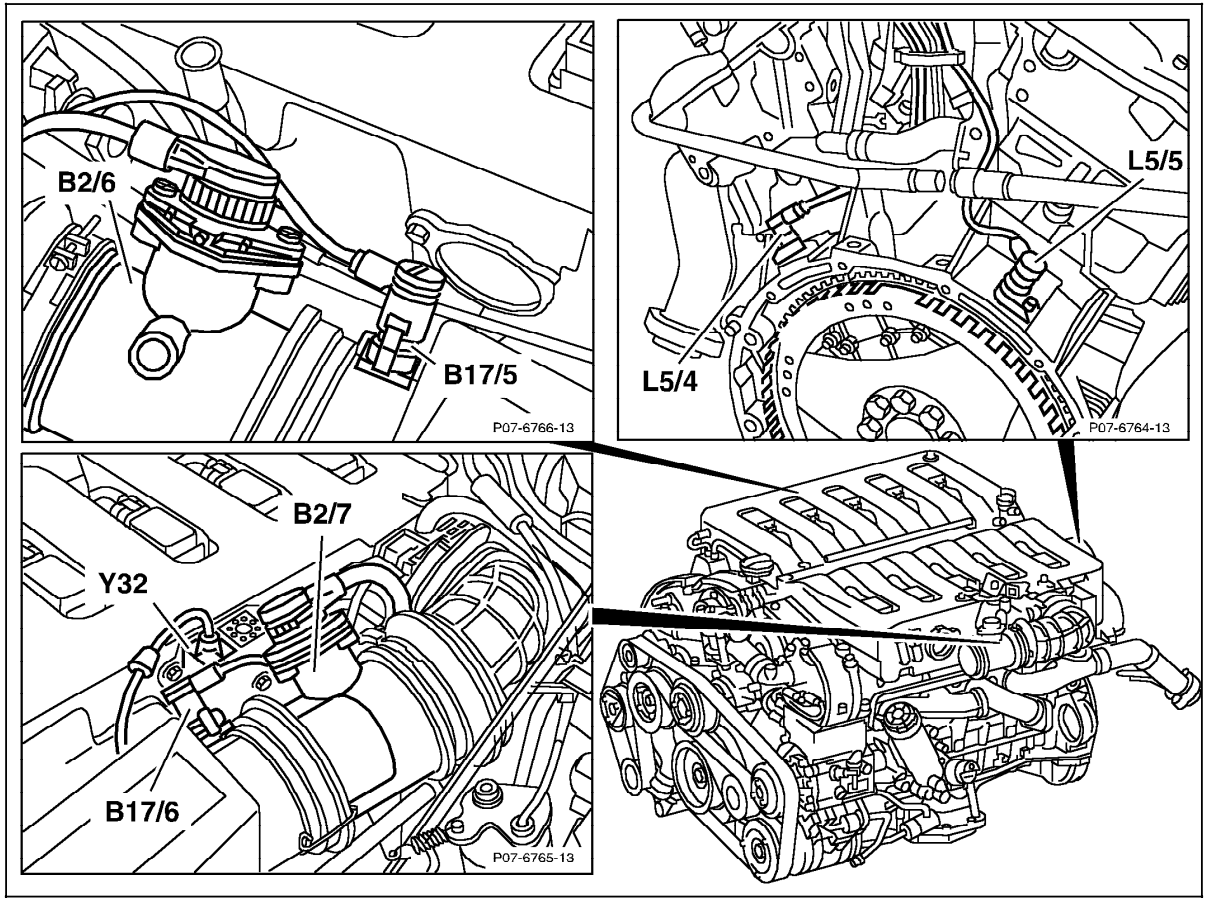
P07.61-0552-06

Figure 8

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

Components on engine
Model 140



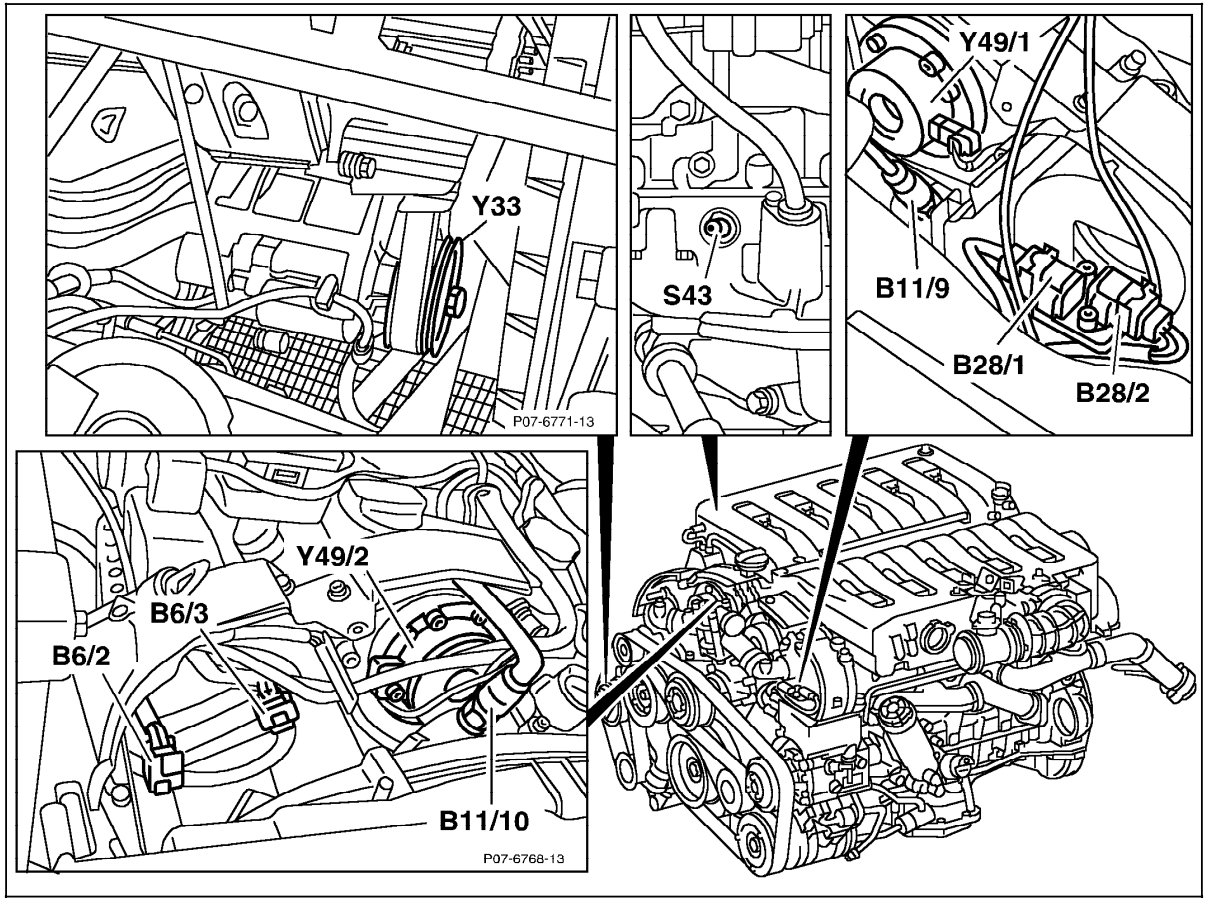
P07.61-2052-06

Figure 9

B2/6	Left hot film MAF sensor (located on right side of engine)
B2/7	Right hot film MAF sensor (located on left side of engine)
B17/5	Left IAT sensor (located in engine compartment, right hand side)
B17/6	Right IAT sensor (located in engine compartment, left hand side)
L5/4	Left CKP sensor
L5/5	Right CKP sensor
Y32	AIR pump switchover valve

Electrical Test Program – Component Locations

Components on engine
Model 140



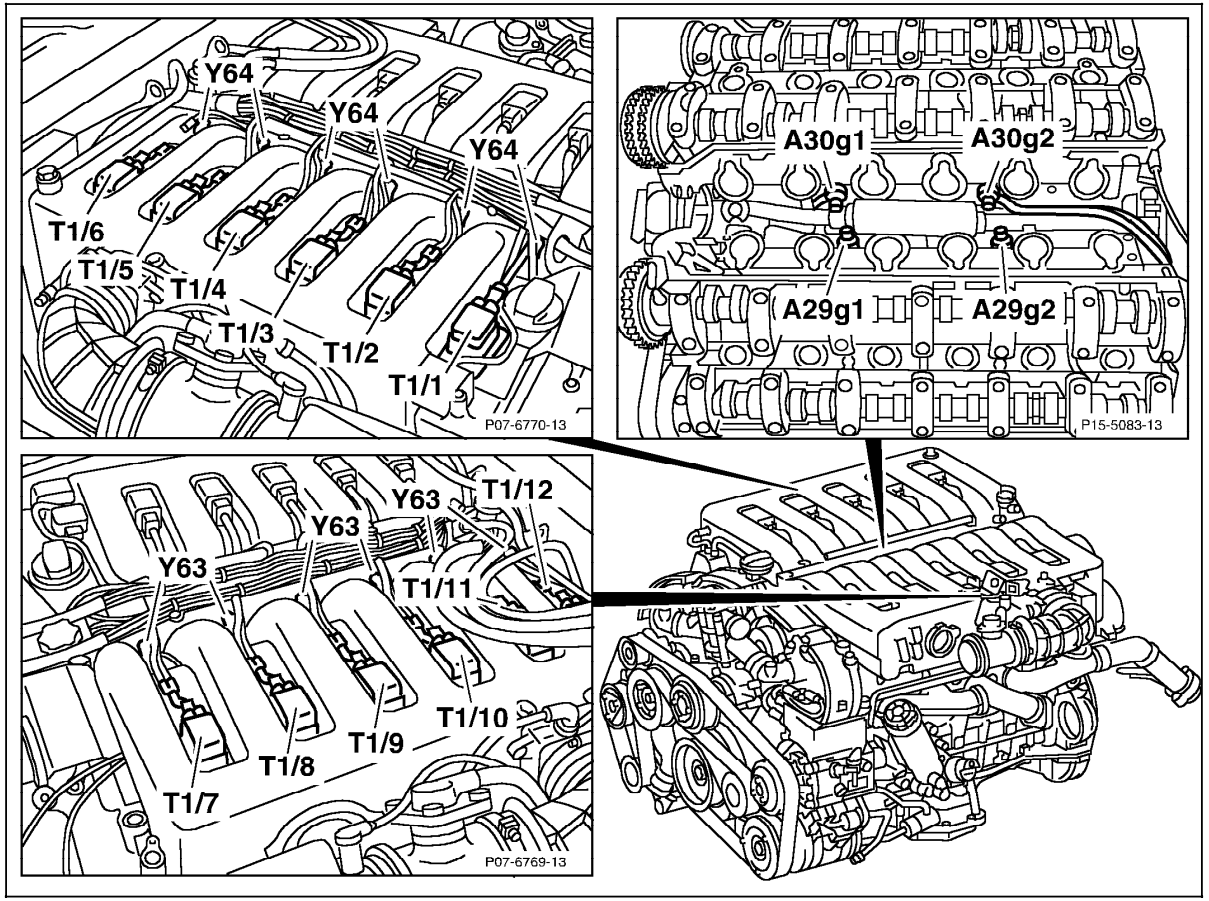
P07.61-2054-06

Figure 10

B6/2	Left camshaft Hall-effect sensor
B6/3	Right camshaft Hall-effect sensor
B11/9	Left ECT sensor
B11/10	Right ECT sensor
B28/1	Left pressure sensor (only USA)
B28/2	Right pressure sensor (only USA)
S43	Oil level switch
Y33	Electromagnetic AIR pump clutch
Y49/1	Left adjustable camshaft timing solenoid
Y49/2	Right adjustable camshaft timing solenoid

Electrical Test Program – Component Locations

Components on engine
Model 140



P07.61-2053-06

Figure 11

A29g1	Left knock sensor 1
A29g2	Left knock sensor 2
A30g1	Right knock sensor 1
A30g2	Right knock sensor 2
T1/1	Ignition coil cylinder 1
T1/2	Ignition coil cylinder 2
T1/3	Ignition coil cylinder 3
T1/4	Ignition coil cylinder 4
T1/5	Ignition coil cylinder 5
T1/6	Ignition coil cylinder 6
T1/7	Ignition coil cylinder 7
T1/8	Ignition coil cylinder 8
T1/9	Ignition coil cylinder 9
T1/10	Ignition coil cylinder 10
T1/11	Ignition coil cylinder 11
T1/12	Ignition coil cylinder 12
Y63	Left injectors
Y64	Right injectors

Electrical Test Program – Component Locations

Engine Compartment
Model 140

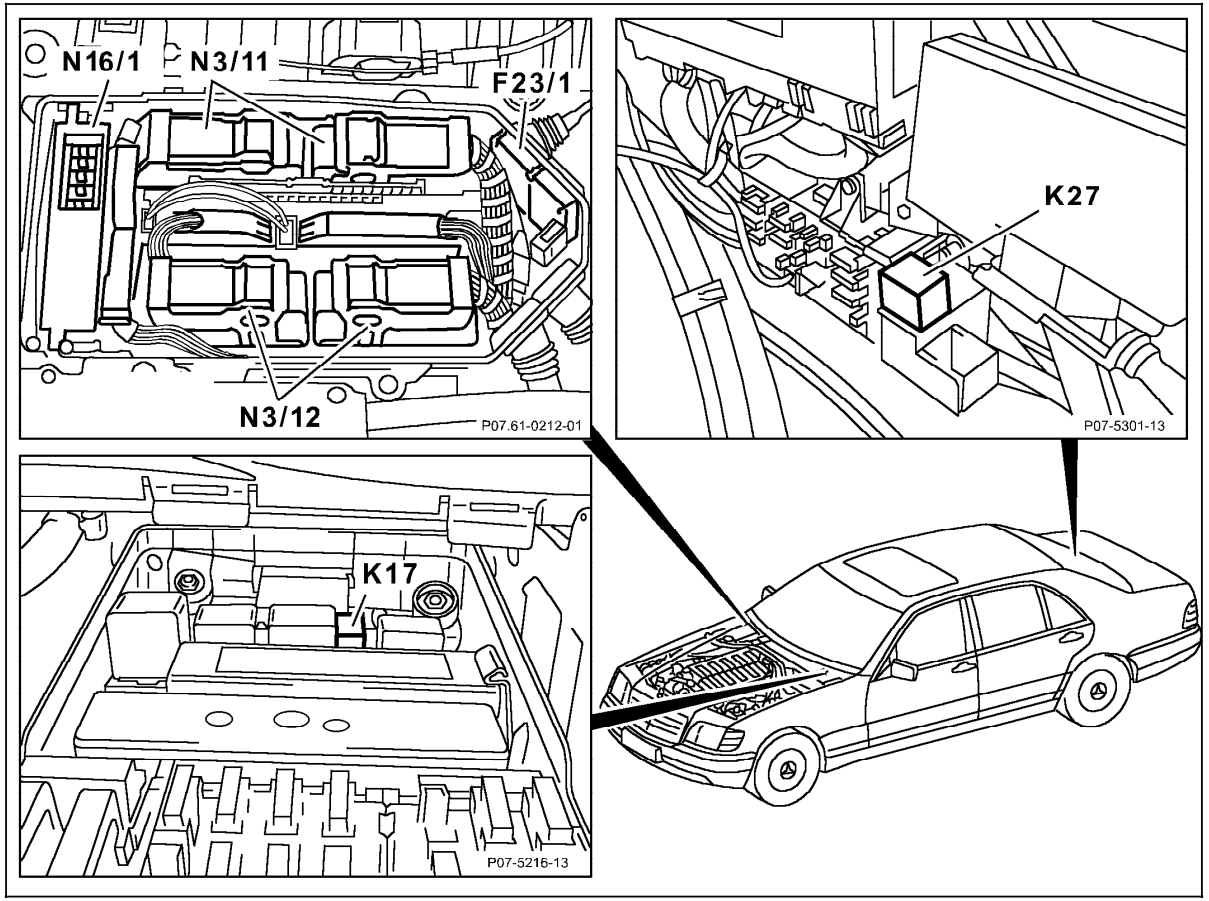


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Figure 12

F23/1 Control module box
K17 AIR relay module
K27 FP relay module
N3/11 Left engine control module (ME-SFI)
N3/12 Right engine control module (ME-SFI)
N16/1 Base module

Electrical Test Program – Component Locations

Engine Compartment
Model 140

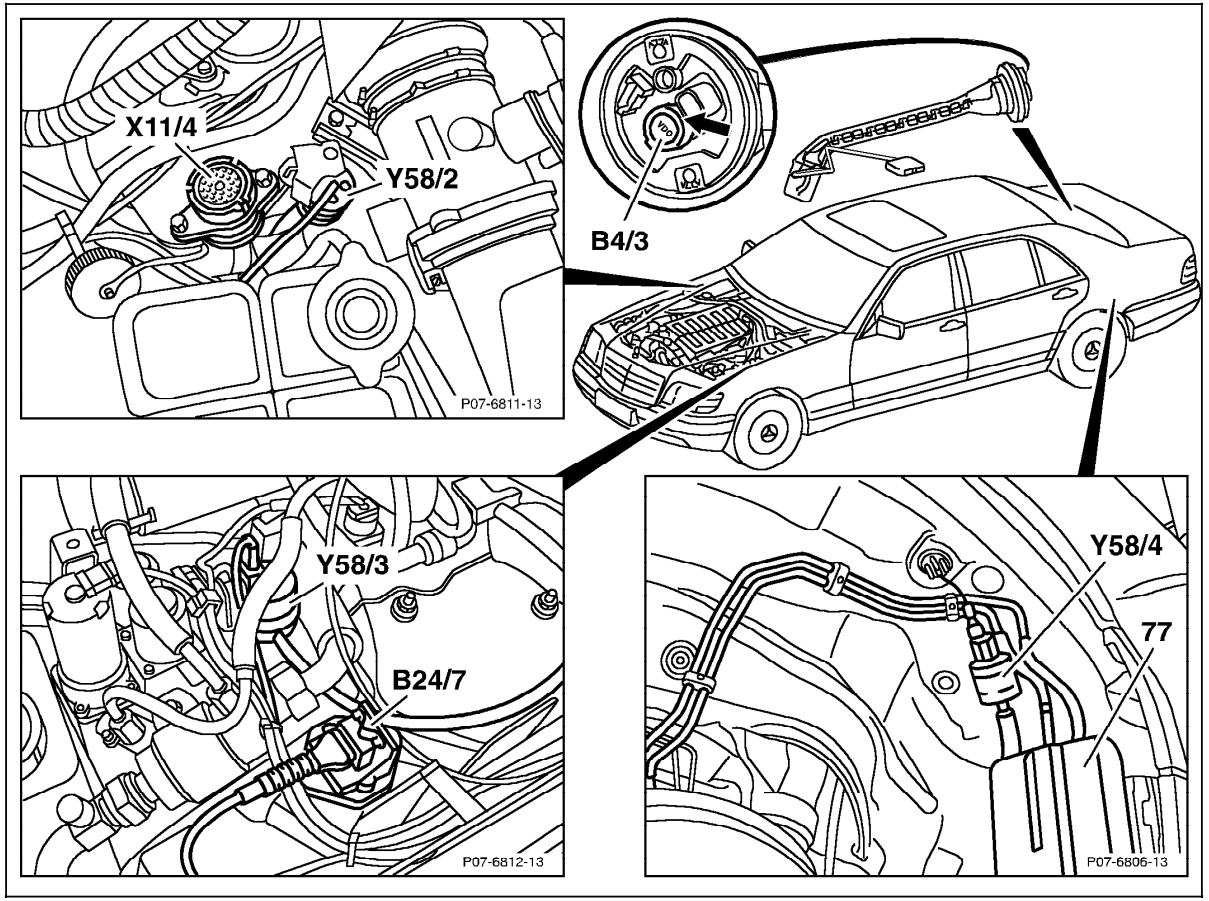

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Figure 13

B4/3	Fuel tank pressure sensor (only USA)
B24/7	Body acceleration sensor (only up to 05/96)
X11/4	Data link connector
Y58/2	Left purge control valve (located in engine compartment, right hand side)
Y58/3	Right purge control valve (located in engine compartment, left hand side)
Y58/4	Activated charcoal canister shut-off valve (only USA)
77	Active charcoal canister

Electrical Test Program – Component Locations

Engine Compartment
Model 140

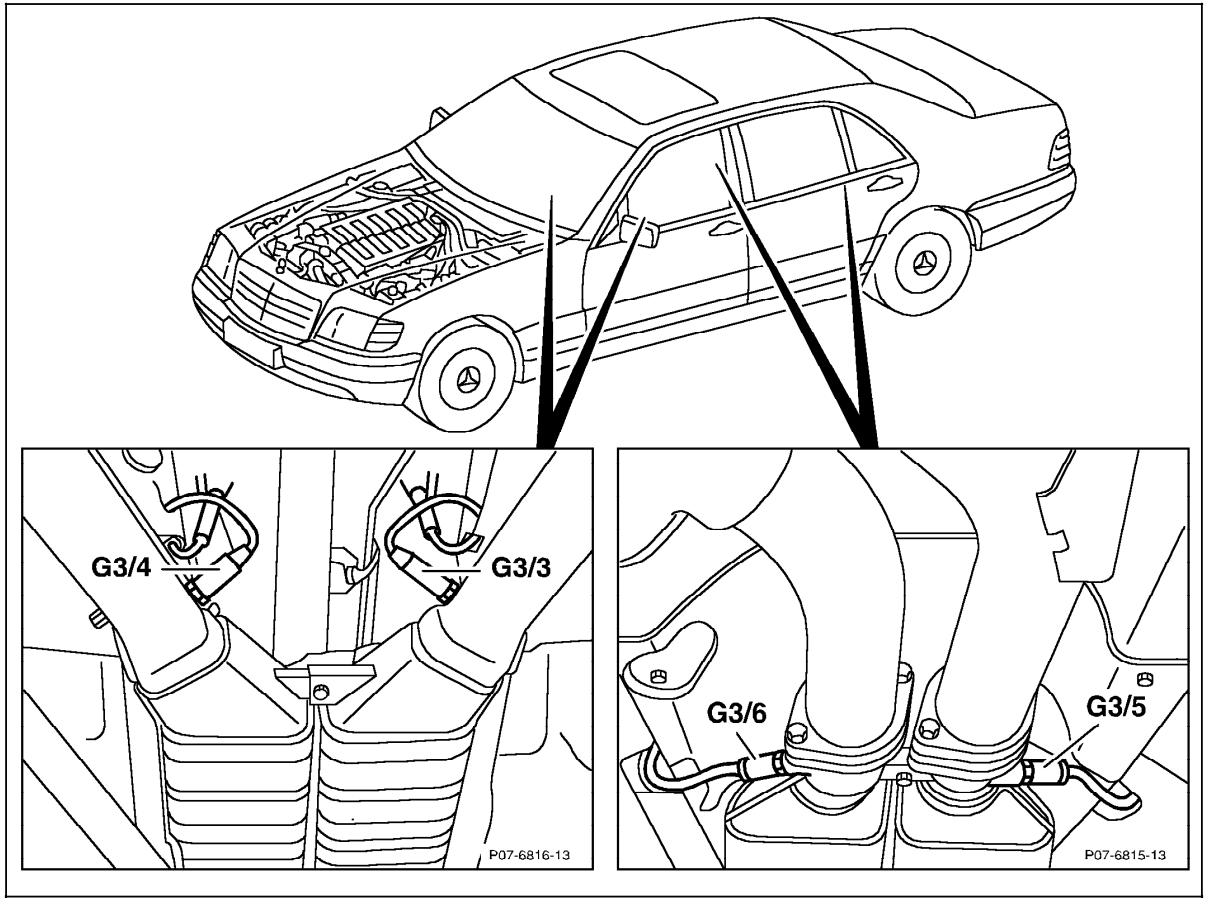

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Figure 14

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

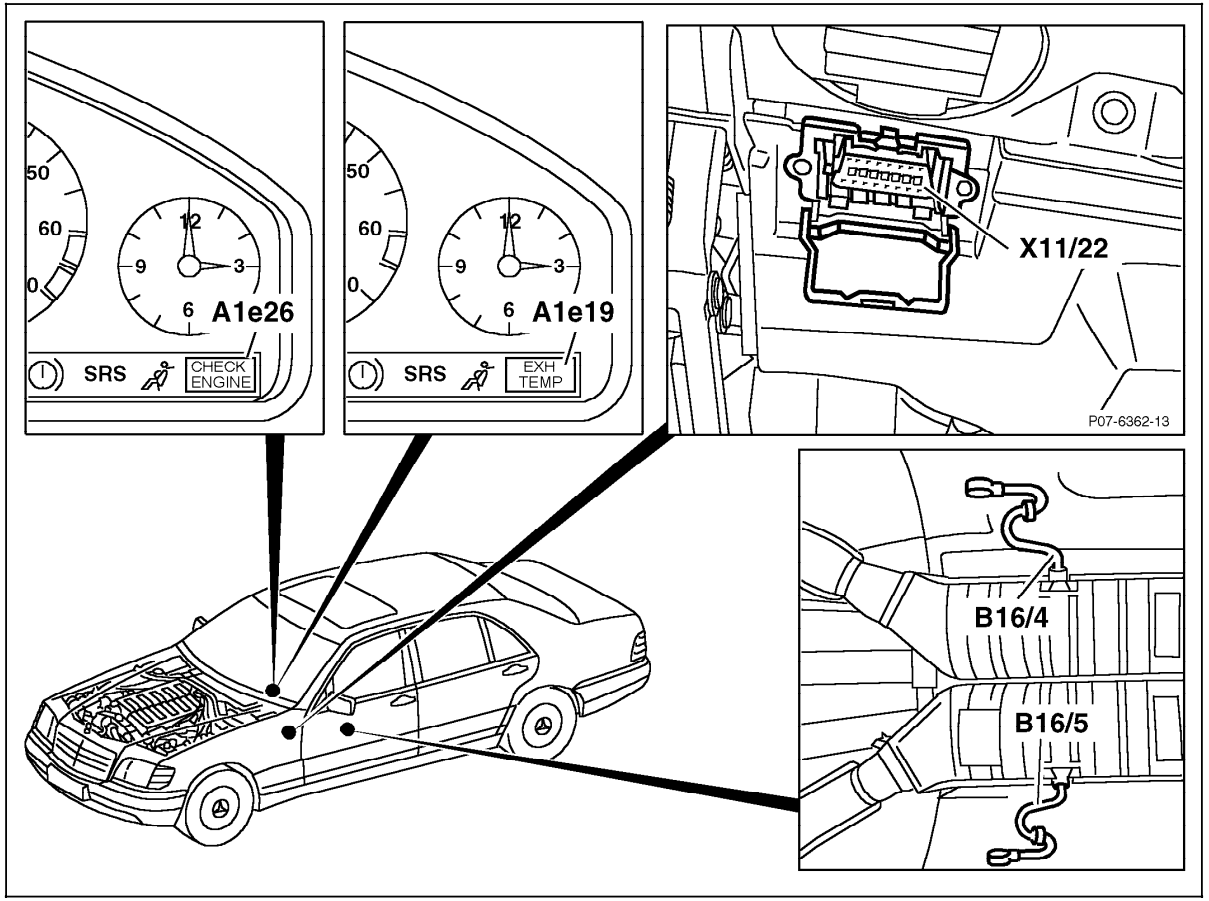

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Figure 15

A1e19 Catalytic converter overheat warning lamp (J up to 05/96)
A1e26 "CHECK ENGINE" MIL (only USA)
B16/4 Left exhaust gas temperature sensor (J up to 05/96)
B16/5 Right exhaust gas temperature sensor (J up to 05/96)
X11/22 Diagnostic module (OBD II) generic scan tool connector (only USA)

Electrical Test Program – Component Locations

Model 140

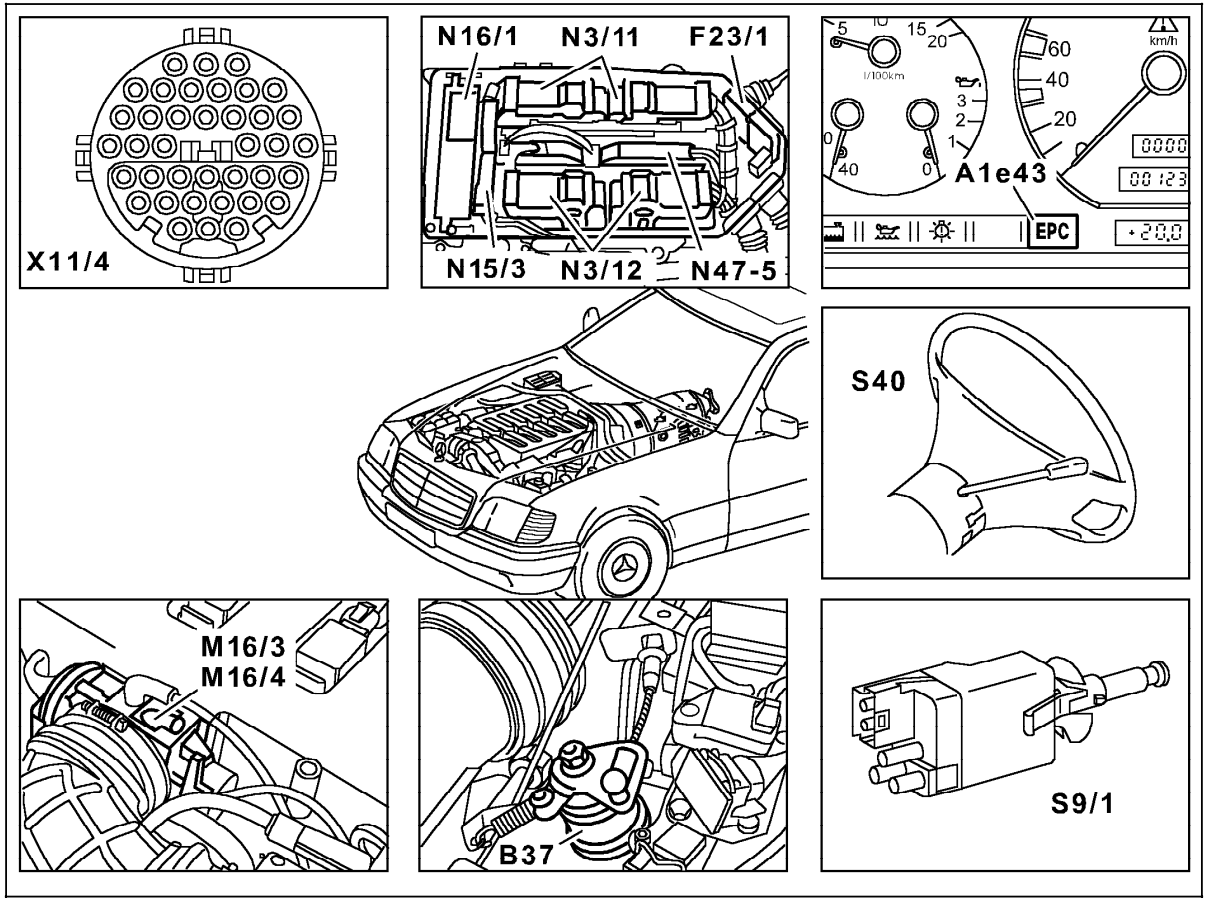

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Figure 16

A1e43 EPC MIL (up to 05/96)
B37 Pedal value sensor
F23/1 Control module box
M16/3 Right EA/CC/ISC actuator (located on left)
M16/4 Left EA/CC/ISC actuator (located on right)
N3/11 Left engine control module (ME-SFI)
N3/12 Right engine control module (ME-SFI)
N15/3 Transmission control module
N16/1 Base module
N47-5 ESP/SPS control module
S9/1 Stop lamp switch
S40 CC switch
- V Decelerate/set
- B Accelerate/set
- SP Memory
- A OFF

X11/4 Data link connector (DTC readout)

Electrical Test Program – Preparation for Test

Preliminary work:
Diagnosis - Malfunction Memory 11

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

1. Review 11, 21, 22, 23, 24, 31, 33, 35, 36,
2. Review section 0,
3. Connect HHT and readout DTC memory, see 11,
4. Ignition: **OFF**
5. Connect test cable with socket box to engine control module (N3/11) or engine control module (N3/12), see 22/5

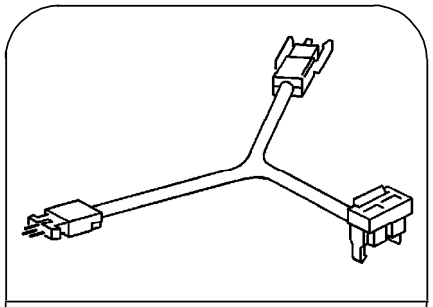
Connect interior harness connector to connection 1 on test cable. Connect engine harness connector to connection 2 on test cable.

Note:
The test program is divided into four sections:
23 SFI Test
24 Ignition System Test
25 EA System Test
26 CC System Test

Note regarding "Test Connection" column:
The numbers indicated in parentheses, for example, ⇒ 1.0 (2A) signify:
2 = Socket 2 on wiring diagram.
A = Connector A on wiring diagram,

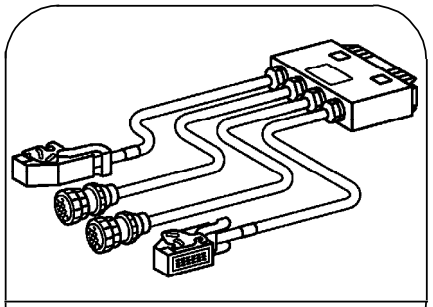
Electrical Test Program – Preparation for Test

Special Tools



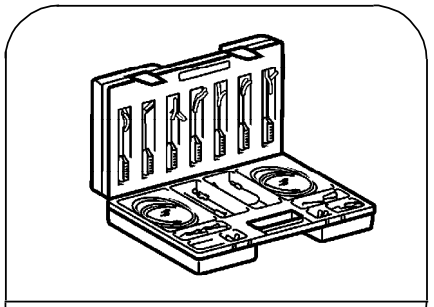
102 589 04 63 00

Test cable



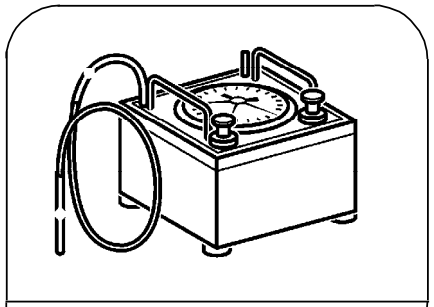
140 589 46 63 00

Test cable, 117-pin



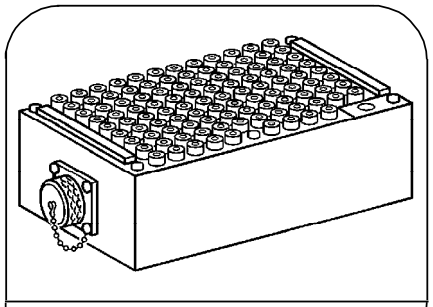
201 589 00 99 00

Electrical connecting set



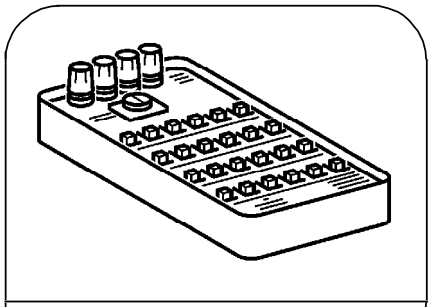
201 589 13 21 00

Tester



129 589 00 21 00

126-pin socket box



124 589 09 63 00

Ohm decade

Test Equipment; See MBUSA Standard Equipment Program

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

Electrical Test Program – Preparation for Test

⚠ **WARNING!**
Persons with heart pacemakers are not to perform repairs on this type of ignition system.

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

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

P15.11-0001-01

Electrical Test Program – Preparation for Test

To Avoid Damage to the Ignition System

- To avoid damage to the engine control module, connect/disconnect the control module connectors only with the ignition: **OFF**.
- Circuit 1 of the ignition coil may not be shorted to ground, e.g. theft deterence.
- Only original equipment should be installed in the ignition system.
- Do not operate the ignition system at cranking speed unless the entire igntion harness is connected.
- Do not perform any tests (grounding of ignition cable 4 disconnecting a spark plug connector or pulling cable 4 out of the ignition coil) at cranking or idle speed.
- The high output side of the ignition system must carry at least 2 kΩ of load (spark plug connector).

Using Test Equipment

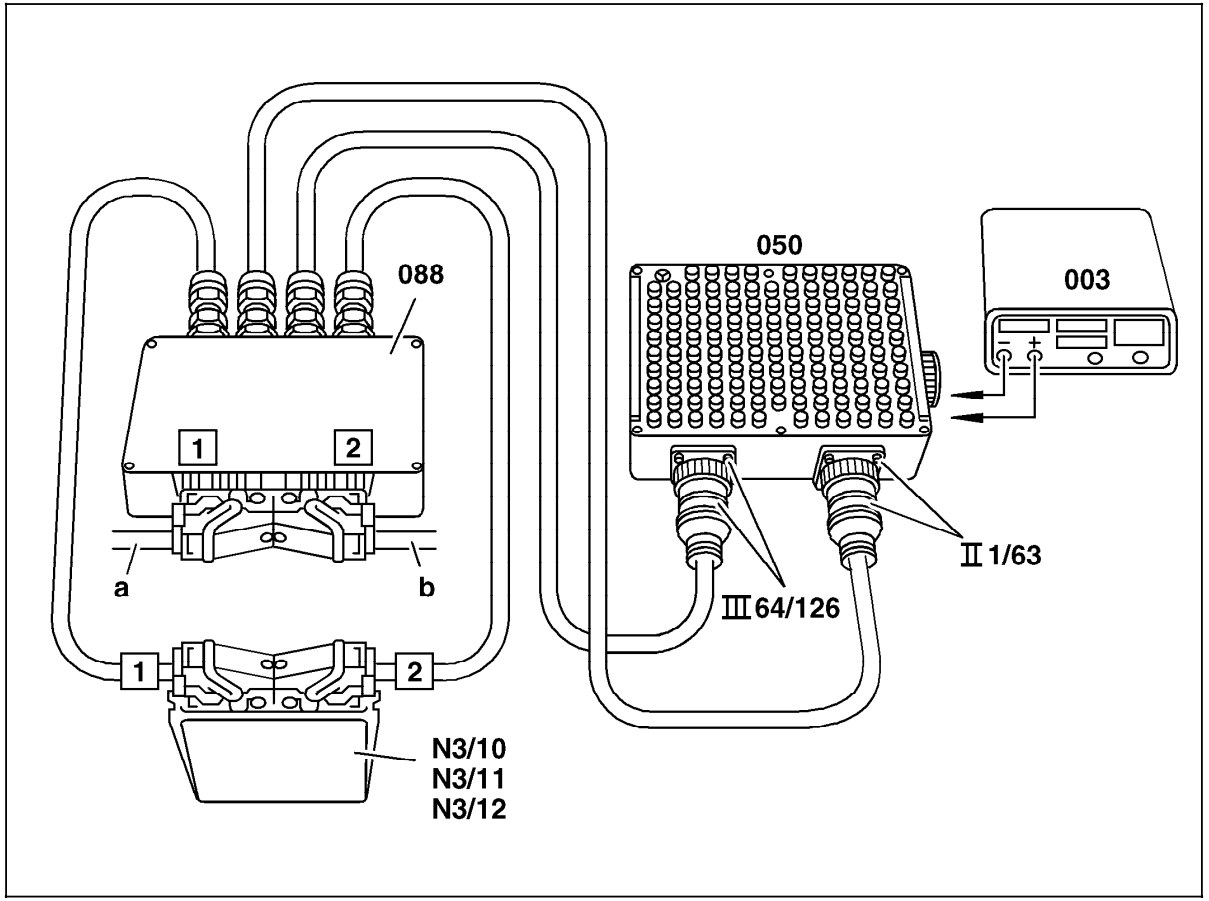
- **Connect the secondary voltage measuring equipment on the corresponding secondary ignition lead only when engine is stopped and ignition is OFF.**
- **If the circuit breaker is activated (power balance test), and the engine stalls, then the test procedure with this tester cannot be performed.**
- **Do not connect a test lamp to circuit 1 or 15 of the ignition coil.**
- If assisting a disabled vehicle and it becomes necessary to perform an igntion spark test, perform this test only on one ignition/sark plug. Ensure a good ground connection to the spark plug.
- ME - SFI: the ignition system is to be turned OFF, when cranking engine to perform compression tests, additionally, it is necessary to disconnect connector 2 from the control module.

i Engine 120 has separate ignition and fuel injection system

Electrical Test Program – Preparation for Test

Connection Diagram - Socket Box

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



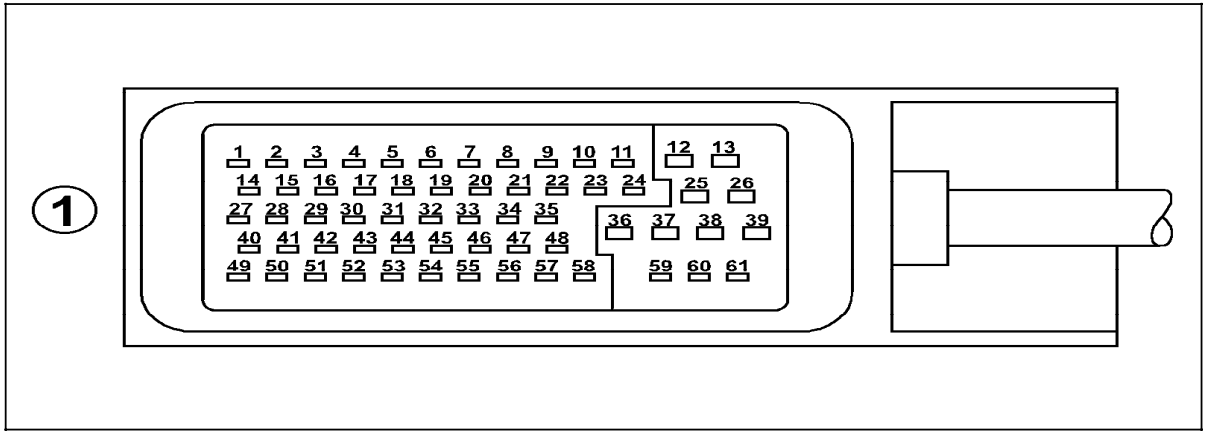
P07.61-2049-06

Figure 1

003	Digital multimeter
050	Socket box (126-pole)
088	Test cable
a	Interior compartment harness
b	Engine compartment harness
N3/11	Left engine control module (ME-SFI)
N3/12	Right engine control module (ME-SFI)
III64/126	Connectors, socket box and test cable
II163	Connectors, socket box and test cable

Electrical Test Program – Preparation for Test

Connector Layout - Engine Control Module
Connector 1 – Interior



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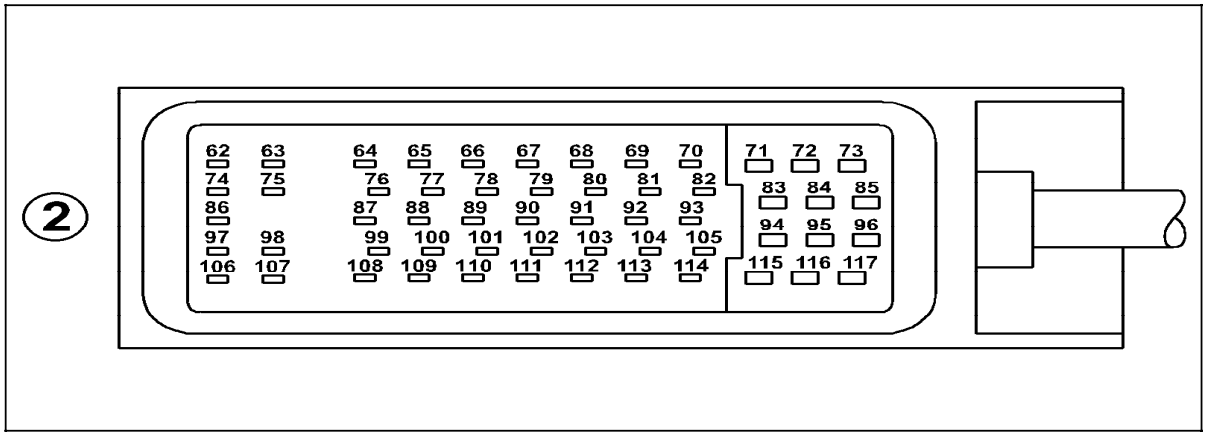
1	Stop lamp switch (S9/1) N.C. contact [2]
2	CC switch (S40), accelerate/set [2]
3	Stop lamp switch (S9/1) N.O. contact [2]
4	Pedal value sensor (B37) nominal value potentiometer 2 (+) [1]
5	–
6	Pedal value sensor (B37) nominal value potentiometer 2 (wiper) [1]
7	–
8	A/C pushbutton control module (N22) [2] (only until 05/96)
9	Left front axle VSS (L6/1) [2]
10	Purge control valve (Y58/3) [1] (Y58/2) [2]
11	"CHECK ENGINE" MIL (A1e26) (only USA) (only until 05/96, as of 06/96 via CAN)
12	O2S 2 (after TWC) heating (G3/5) [1] (G3/6) [2] (only USA)
13	O2S 1 (before TWC) heating (G3/3) [1] (G3/4) [2]
14	Starter signal, circuit 50 (as of 06/98)
15	–
16	CTP (idle) signal
17	Pedal value sensor (B37) nominal value potentiometer 1 (+) [2]
18	Pedal value sensor (B37) nominal value potentiometer (–)
19	Pedal value sensor (B37) nominal value potentiometer 2 (wiper)
20	–
21	EPC MIL (A1e43) [2]
22	Left rear axle VSS (L6/3) [2]
23	Tank open signal [2] (only until 05/96) (only USA)
24	FP relay module (K27) [2]
25	Voltage supply, circuit 87M)
26	Output ground (W15), right footwell
27	CC switch (S40), control contact [2]
28	CC switch (S40), off [2]
29	–
30	CC switch (S40), resume [2]
31	CC switch (S40), decelerate/set [2]
32	Oil level switch (S43) [2]
33	Fuel reserve signal (only until 05/96, as of 06/96 via CAN)
34	Activated charcoal canister shut-off valve (Y58/4) (only USA) (model 140 and 129 as of 09/97)
35	Voltage supply, circuit 30
36	Voltage supply, circuit 87E, for EA function
37	–
38	Electronics ground (W15/1), right footwell
39	Output ground (W15), right footwell
40	O2S 1 (before TWC) ground (G3/3) [1] (G3/4) [2]
41	O2S 1 (before TWC) signal (G3/3) [1] (G3/4) [2]
42	O2S 2 (after TWC) signal (G3/5) [1] (G3/6) [2] (only USA)
43	–
44	Body acceleration sensor (B24) and fuel tank pressure sensor (B4/3), 5V voltage supply
45	Ground (W15/1) coding [1]
46–47	–
48	Body acceleration sensor (B24), signal [2]
49–50	–
51	Purge monitoring pressure sensor (B4/4) [2], model 129 up to 08/97, (only USA) Fuel tank pressure sensor (B4/3), model 140, model 129 as of 09/97, (only USA) [2]
52	–
53	Ground, sensors [2]
54	–
55	Diagnosis output (injection system), DLC (X11/4)
56	Diagnosis output, (engine speed) DLC (X11/4) [2]
57	AIR relay module (K17) [2]
58	Instrument cluster (fuel consumption signal) [2]
59	–
60	CAN data line "H"
61	CAN data line "L"

[1] Left engine control module (N3/11) only

[2] Right engine control module (N3/12) only

Electrical Test Program – Preparation for Test

Connector Layout - Engine Control Module
Connector 2 – Engine compartment



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62 - 63 –
64 IAT sensor (+) (B17/6) 1) (B17/5) 2)
65 Pressure sensor (B28/1) 1) (B28/2) 2) (only USA)
66 Camshaft Hall-effect sensor (B6/2) 1) (B6/3) 2)
67 Hot film MAF sensor (+) (B2/6) 1) (B2/7) 2)
68 Hot film MAF sensor (–) (B2/6) 1) (B2/7) 2)
69 Injector (Y63y10) 1) (Y64y4) 2)
70 Injector (Y63y8) 1) (Y64y2) 2)
71 Injector (Y63y11) 1) (Y64y5) 2)
72 Injector (Y63y7) 1) (Y64y1) 2)
73 Ground bridge to pin 96
74 EA/CC/ISC actuator (–) (M16/4) 1) (M16/3) 2)
75 EA/CC/ISC actuator (+) (M16/4) 1) (M16/3) 2)
76 ECT sensor (+) (B11/9) 1) (B11/10) 2)
77 –
78 CKP sensor (–) (L5/4) 1) (L5/5) 2)
79 Front KS 1 (+) (A29g1) 1) (A30g1) 2)
80 Front KS 1 (–) (A29g1) 1) (A30g1) 2)

1) Left engine control module (N3/11) only
2) Right engine control module (N3/12) only

81 Oil temperature sensor (Model 129 only, as of 06/98)
82 Injector (Y63y12) 1) (Y64y6) 2)
83 Ignition coil (T1/7) 1) (T1/1) 2)
84 Ignition coil (T1/11) 1) (T1/5) 2)
85 Ignition coil (T1/9) 1) (T1/3) 2)
86 –
87 Ground: IAT sensor, Intake MAP sensor, Camshaft Hall-effect sensor, ECT sensor (only USA)
88 Pressure sensor, 5V voltage supply (B28/1) 1) (B28/2) 2) (only USA)
89 CKP sensor (+) (L5/4) 1) (L5/5) 2)
90 Rear KS 2 (+) (A29g2) 1) (A30g2) 2)
91 Rear KS 2 (–) (A29g2) 1) (A30g2) 2)
92 –
93 Injector (Y63y9) 1) (Y64y3) 2)
94 Ignition coil (T1/8) 1) (T1/2) 2) (–)
95 Ignition coil (T1/12) 1) (T1/6) 2) (–)
96 Ground bridge to pin 73

97 EA/CC/ISC actuator, actual value potentiometer (wiper) (M16/4r1) 1) (M16/3r1) 2)
98 EA/CC/ISC actuator, actual value potentiometer (–) (M16/4r1–r2) 1) (M16/3r1–r2) 2)
99 - 103 –
104 Starter relay module (as of 06/98)
105 –
106 EA/CC/ISC actuator, actual value potentiometer (+) (M16/4r1-r2) 1) (M16/3r1-r2) 2)
107 EA/CC/ISC actuator, actual value potentiometer (wiper) (M16/4r2) 1) (M16/3r2) 2)
108-112 –
113 Adjustable camshaft timing solenoid (Y49/1) 1) (Y49/2) 2)
114 AIR pump switchover valve (Y32)
115 Ignition coil (T1/10) 1) (T1/4) 2) (–)
116-117 –

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
1.0	P0 560 P1 587	**Engine control module (ME-SFI) (N3/11 or N3/12)** Voltage supply Circuit 30	N3/11 N3/12 26 — (1.26) 35 — (1.35)	Ignition: **ON**	11 – 14 V	⇒ 1.1
1.1		Ground wire	N3/11 N3/12 26 — (1.26) X11/4 — 2 39 — (1.39) — 2	Ignition: **ON**	11 – 14 V	Wiring, **Model 129:** Ground (W27), module box bracket. **Model 140:** Output ground (W15), right footwell. ⇒ 1.2
1.2		Voltage supply Circuit 30	N3/11 N3/12 X11/4 1 — 35 — (1.35)	Ignition: **ON**	11 – 14 V	Wiring, Base moduel (N16/1) or fuse on base module.

Electrical Test Program – Sequential Multiport Fuel Injection System Test

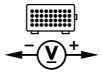
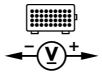
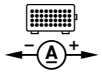
⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
2.0	P0 560 P1 587	**Engine control module (ME-SFI) (N3/11 or N3/12)** Voltage supply Circuit 87L	N3/11 N3/12 38 (1.38) — 24 (1.24)	Ignition: **ON**	11 – 14 V	⇒ 2.1
2.1		Electronics ground	N3/11 N3/12 38 (1.38) — X11/4 — 2	Ignition: **ON**	11 – 14 V	Wiring, **Model 129, 140:** Electronics ground (W15/1), right footwell. ⇒ 2.2
2.2		Voltage supply Circuit 87L	N3/11 N3/12 X11/4 1 — 24 (1.24)	Ignition: **ON** Ignition: **OFF**	11 – 14 V < 1 V	Wiring, Base module (N16/1) or fuse on base module, Ignition/starter switch (S2/1)
3.0	P0 560 P1 587	**Engine control module (ME-SFI) (N3/11 or N3/12)** Voltage supply Circuit 87M1e	N3/11 N3/12 39 (1.39) — 36 (1.36)	Ignition: **ON** Ignition: **OFF**	11 – 14 V < 1 V	Wiring.

Electrical Test Program – Test

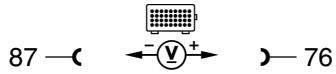
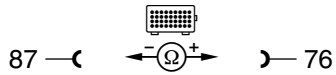
⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
4.0	P0 100 P1 146	**Left hot film MAF sensor (B2/6)** **Right hot film MAF sensor (B2/7)** Voltage at hot film	N3/11 N3/12 68 (2.68) — V — 67 (2.67)	Ignition: **ON** Engine: **at Idle** Engine coolant temperature >70°C	0.6 – 0.9 V [1]	Wiring ⇒ 4.1, Air intake system leak, B2/6 or B2/7
4.1		Ground wire for hot film MAF sensor (B2/6 or B2/7)	N3/11 N3/12 38 (1.38) — Ω — 67 (2.67)	Ignition: **OFF** Disconnect MAF sensor (B2/6 or B2/7) connector. Bridge sockets 1 and 4	< 1 Ω	Ground wire.
5.0	P0 105 P1 149	**Left pressure sensor (B28/1)** **Right pressure sensor (B28/2)** Sender signal (only USA)	N3/11 N3/12 87 (2.87) — V — 65 (2.65)	Connect vacuum tester to pressure sensor (B28/1 or B28/2) using Y-fitting (see 21) Ignition: **ON** Engine: **at Idle**	> 3.5 V < 2 V and pressure climbs to > 500 mbar.	Vacuum line, Wiring, ⇒ 5.1 B28/1 or B28/2

[1] Voltage increases with increasing rpm.

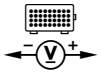
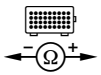
Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
5.1		Pressure sensor (B28/1 or B28/2) Voltage supply	N3/11 N3/12  87 (2.87) — 88 (2.88)	Ignition: **ON**	4.7 – 5.3 V	N3/11 or N3/12
6.0		**Right engine control module (N3/12) only** **FP relay module (K27)** Activation	N3/12  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.	⇒ 6.1, N3/12
6.1		Current draw (K27)	N3/12  26 (1.26) — 24 (1.24)	Ignition: **ON**	0.1 – 0.3 A	Wiring, K27

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
7.0	P0 115 P1 147	**Left ECT sensor (B11/9)** **Right ECT sensor (B11/10)** Voltage	N3/11 N3/12  87 (2.87) — 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 %	⇒ 7.1, N3/11 or N3/12
7.1		Resistance	N3/11 N3/12  87 (2.87) — 76 (2.76)	Ignition: **OFF** Disconnect connector 2 on engine control module (N3/11 or N3/12).	°C Ω 20 2500 30 1700 40 1170 50 830 60 600 70 435 80 325 90 245 100 185 ±5 %	Wiring, ⇒ 7.2
7.2		ECT sensor (B11/9 or B11/10) Resistance	B11/9 B11/10  1 — 4	Disconnect connector on ECT sensor (B11/9 or B11/10).	Nominal value, see ⇒ 7.1	B11/9 or B11/10

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
8.0	P0 110 P1 148	**Left IAT sensor (B17/5)** **Right IAT sensor (B17/6)** Voltage	N3/11 N3/12  87 (2.87) — 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 %	⇒ 8.1, N3/11 or N3/12
8.1		Resistance (B17/5 or B17/6)	N3/11 N3/12  87 (2.87) — 64 (2.64)	Ignition: **OFF** Disconnect connector 2 on engine control module (N3/11 or N3/12).	°C Ω 10 9670 20 6060 30 3900 40 2600 50 1760 60 1220 70 860 ±5 %	Wiring, ⇒ 8.2
8.2		IAT sensor (B17/5 or B17/6) Resistance	B17/5 B17/6  1 — 2	Disconnect connector from IAT sensor (B17/5 or B17/6).	Nominal value, see ⇒ 8.1	B17/5 or B17/6

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
9.0		**Right engine control module (N3/12) only** TN-signal output	N3/12 38 (1.38) — (⏚) — 56 (1.56)	Test with Oscilloscope: Engine: **Start** or Engine: **at Idle**	Signal: see Figure 2.	Wiring, N3/12
			N3/12 38 (1.38) — (V) — 56 (1.56)	Test with multimeter: (only if oscilloscope not available)	5 – 7.5 V	
10.0	P0 130 P0 133 P0 140 P0 150 P0 153 P0 160	**Left O2S 1 (before TWC) (G3/3)** **Right O2S 1 (before TWC) (G3/4)** O2S signal	N3/11 N3/12 40 (1.40) — (V) — 41 (1.41)	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, G3/3 or G3/4, ⇒ 11.0
11.0	P0 135 P0 155	**Left O2S 1 (before TWC) (G3/3)** **Right O2S 1 (before TWC) (G3/4)** O2S heater activation	N3/11 N3/12 13 (1.13) — (V) — 25 (1.25)	ECT > 80 ° C, run engine at idle for at least two minutes.	11 – 14 V	⇒ 11.1, N3/11 or N3/12
11.1		O2S 1 (G3/3 or G3/4) Current draw	N3/11 N3/12 26 (1.26) — (A) — 13 (1.13)	Ignition: **ON**	0.6 – 3.4 A	Wiring, 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
12.0.	P0 136 P0 156	**Left O2S 2 (afterTWC) (G3/5)** **Right O2S 2 (afterTWC) (G3/6)** O2S signal (only USA)	N3/11 N3/12 40 (1.40) — V — 42 (1.42)	ECT > 80° C, Engine: **Start** Raise and hold engine speed at 2000 – 3000 rpm for approx. two minutes until O2S 2 heater turns on (see HHT).	The range of 450mV to 550mV, must be attained or not attained within 1 minute.	Wiring, ⇒ 13.0
13.0	P0 141 P0 161	**Left O2S 2 (after TWC) (G3/5)** **Right O2S 2 (after TWC) (G3/6)** O2S heater activation (only USA)	N3/11 N3/12 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	⇒ 13.1, N3/11 or N3/12
13.1		O2S 2 (G3/5 or G3/6) Current draw	N3/11 N3/12 26 (1.26) — A — 12 (1.12)	Ignition: **ON**	0.6 – 3.4 A	Wiring, G3/5 or G3/6

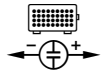
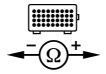
Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
14.0	P0 201 P0 207	**Injector (Y64y1, Y63y7)** Activation and injection time	N3/11 N3/12 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 (signals see Figures 2 and 3)	⇒ 14.1, N3/11 or N3/12, **Further possibilities:** ECT sensor (B11/9 or B11/10), IAT sensor (B17/5 or B17/6), O2S 1 (G3/3 or G3/4).
14.1		Resistance	N3/11 N3/12 72 (2.72) — 25 (1.25)	Ignition: **OFF**	14 – 17 Ω	Wiring, Y64y1, Y63y7

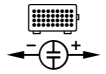
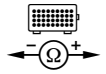
Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
15.0	P0 202 P0 208	**Injector (Y64y2, Y63y8)** Activation and injection time	N3/11 N3/12 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 (signals see Figures 2 and 3)	⇒ 15.1, N3/11 or N3/12, **Further possibilities:** ECT sensor (B11/9 or B11/10), IAT sensor (B17/5 or B17/6), O2S 1 (G3/3 or G3/4).
15.1		Resistance	N3/11 N3/12 70 (2.70) — 25 (1.25)	Ignition: **OFF**	14 – 17 Ω	Wiring, Y64y2, Y63y8

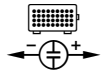
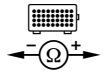
Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
16.0	P0 203 P0 209	**Injector (Y64y3, Y63y9)** Activation and injection time	N3/11 N3/12  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 (signals see Figures 2 and 3)	⇒ 16.1, N3/11 or N3/12, **Further possibilities:** ECT sensor (B11/9 or B11/10), IAT sensor (B17/5 or B17/6), O2S 1 (G3/3 or G3/4).
16.1		Resistance	N3/11 N3/12  93 (2.93) — 25 (1.25)	Ignition: **OFF**	14 – 17 Ω	Wiring, Y64y3, Y63y9

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
17.0	P0 204 P0 210	**Injector (Y64y4, Y63y10)** Activation and injection time	N3/11 N3/12  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 (signals: see Figures 2 and 3).	⇒ 17.1, N3/11 or N3/12 **Further possibilities:** ECT sensor (B11/9 or B11/10), IAT sensor (B17/5 or B17/6), O2S 1 (G3/3 or G3/4).
17.1		Resistance (Y64y4 or Y63y10)	N3/11 N3/12  69 (2.69) — 25 (1.25)	Ignition: **OFF**	14 – 17 Ω	Wiring, Y64y4 or Y63y10

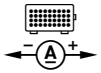
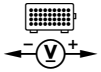
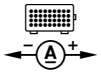
Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
18.0	P0 205 P0 211	**Injector (Y64y5, Y63y11)** Activation and injection time	N3/11 N3/12  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 (signals: see Figures 2 and 3).	⇒ 18.1, N3/11 or N3/12 **Further possibilities:** ECT sensor (B11/9 or B11/10), IAT sensor (B17/5 or B17/6), O2S 1 (G3/3 or G3/4).
18.1		Resistance (Y64y5 or Y63y11)	N3/11 N3/12  71 (2.71) — 25 (1.25)	Ignition: **OFF**	14 – 17 Ω	Wiring, Y64y5, Y63y11

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
19.0	P0 206 P0 212	**Injector (Y64y6, Y63y12)** Activation and injection time	N3/11 N3/12 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 (see Figures 2 and 3)	⇒ 19.1, N3/11 or N3/12, **Further possibilities:** ECT sensor (B11/9 or B11/10), IAT sensor (B17/5 or B17/6), O2S 2 (G3/3 or G3/4).
19.1		Resistance (Y64y6 or Y63y12)	N3/11 N3/12 82 (2.82) — 25 (1.25)	Ignition: **OFF**	14 – 17 Ω	Wiring, Y64y6, Y63y12
20.0	P0 410 P1 453 P1 463	**Right engine control module (N3/12)** **AIR relay module (K17)** Activation	N3/12 57 (1.57) — 25 (1.25)	Disconnect right ECT sensor (B11/10) 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.	⇒ 20.1, N3/12

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
20.1		Current draw (K17)	N3/12  38 (1.38) — A — 57 (1.57)	Ignition: **ON**	0.1 – 0.3 A	Wiring, K17
21.0	P0 410 P1 420 P1 463	**Right engine control module (N3/12)** **AIR pump switchover valve (Y32)** Activation	N3/12  114 (2.114) — V — 25 (1.25)	Disconnect right ECT sensor (B11/10) 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.	⇒ 21.1, N3/12
21.1		Current draw (Y32)	N3/12  38 (1.38) — A — 114 (2.114)	Ignition: **ON**	0.3 – 0.5 A	Wiring, Y32

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
22.0	P1 519 P1 522 P1 525 P1 533	**Left adjustable camshaft timing solenoid (Y49/1)** **Right adjustable camshaft timing solenoid (Y49/2)** Current draw	Y49/1 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. 1.0 A	⇒ 22.1, ⇒ 23.0, N3/11 or N3/12.
22.1		Resistance Y49/1 or Y49/2	Y49/1 Y49/2 1 — (Ω) — 2	Ignition: **OFF** Unplug connector on left or right camshaft timing solenoid (Y49/1 or Y49/2).	7 – 12 Ω	Y49/1 or Y49/2
23.0	P1 519 P1 522 P1 525 P1 533	**Left adjustable camshaft timing solenoid (Y49/1)** **Right adjustable camshaft timing solenoid (Y49/2)** Mechanical function	N3/11 N3/12 113 (2.113) — 38 (1.38)	Engine: **at Idle** Bridge sockets on socket box for a maximum of 10 seconds only.	Engine runs rough after approx. 5 seconds.	Check function of camshaft adjuster (see SMS, Engine 120, Job No. 05-2160).

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
24.0	P0 440 P0 441 P0 446 P0 443 P1 443 P1 490	**Left purge control valve (Y58/2)** **Right purge control valve (Y58/3)** Activation	N3/11 N3/12 10 (1.10) — 25 (1.25)	Engine: **at Idle** and at operating temperature.	After approx. 1 minute, purge control valve (Y58/2 or Y58/3) must noticeably cycle Signal (see Figure 4).	⇒ 24.1, ⇒ 25.0, N3/11 or N3/12
24.1		Current draw (y58/2 or Y58/3)	N3/11 N3/12 38 (1.38) — 10 (1.10)	Ignition: **ON**	0.1 – 0.3 A	Wiring, Y58/2 or Y58/3
25.0	P0 440 P0 441 P1 443	**Purge control valve (Y58/2 or Y58/3)** Vacuum control		Connect vacuum tester to purge control valve (Y58/2 or Y58/3) connector (A) (see 21). Engine at operating temperature and at idle, increase engine speed to maximum 3000 rpm	 After approx. 1 minute, > 50 mbar and needle oscillates.	Vacuum line, Y58/2 or Y58/3

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
26.0	P0 440 P0 442 P0 445 P0 446	**Only (USA), Model 140 and 129 as of 09/97 Right engine control module (N3/12)** **Purge system** Leaks Activated charcoal canister shut-off valve (Y58/4) activated	N3/12 26 — (1.26) 34 — (1.34)	Disconnect purge line (A) to charcoal canister on right purge control valve (Y58/3, left side of engine compartment). Connect vacuum tester to purge line (see 21). 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, Activated charcoal canister, Y58/4, Fuel tank pressure sensor (B4/3)
27.0	P0 446	**Only (USA), Model 140 and 129 as of 09/97 Right engine control module (N3/12)** **Activated charcoal canister shut-off valve (Y58/4)** Current draw	N3/12 38 — (1.38) 34 — (1.34)	Ignition: **ON**	0.5 – 0.9 A	Fuses, Wiring, Y58/4

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
28.0	P0 446 P0 450 P0 455	**Only** (USA), **Model 140 and 129 as of 09/97** **Right engine control module (N3/12)** **Fuel tank pressure sensor (B4/3)** Sender signal Activated charcoal canister shut-off valve (Y58/4) activated	N3/12 53 (1.53) — (V) — 51 (1.51) N3/12 26 (1.26) — 34 (1.34)	Disconnect purge line (A) to charcoal canister on right purge control valve (Y58/3, left side of engine compartment). Connect vacuum tester to purge line (see 21). Ignition: **ON** Apply approx. 25 mbar of vacuum.	 > 3 V < 2.5 V	⇒ 28.1, Wiring, Vacuum line, Activated charcoal canister plugged, B4/3
28.1		**Only** (USA) Fuel tank pressure sensor (B4/3) Voltage supply	N3/12 53 (1.53) — (V) — 44 (1.44)	Ignition: **ON**	4.7 – 5.3 V	N3/12

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
29.0	P0 450	**Only** (USA), **Model 129 up to 09/97** **Right engine control module (N3/12)** **Purge monitoring pressure sensor (B4/4)** Sender signal	N3/12 53 (1.53) — (V) — 51 (1.51)	Disconnect purge line (A) to charcoal canister on purge monitoring pressure sensor (B4/4). Connect vacuum tester to purge monitoring pressure sensor (see 21). Ignition: **ON** Apply approx. 300 mbar of vacuum.	 > 3.5 V < 3 V	Wiring, ⇒ 29.1, B4/4
29.1		Purge monitoring pressure sensor (B4/4) Voltage supply	N3/12 53 (1.53) — (V) — 44 (1.44)	Ignition: **ON**	4.7 – 5.3 V	N3/12

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
30.0	P0 600 P1 570 P1 588 P1 641 P1 747	**CAN data bus**	N3/11 N3/12 60 (1.60) — 61 (1.61)	Ignition: **OFF** Disconnect connector 1 from test cable and measure resistance directly at connector 1 (interior) using an ohmmeter. Wire connections: see 22.	75 – 85 Ω	⇒ 30.1, ⇒ 30.2, Data line.
30.1		CAN element in RCL control module (N54) Resistance	N54 N54/1 L — H	Ignition: **OFF** Disconnect control module (N54 or N54/1) and test directly at pins (Figure 5).	115 – 125 Ω	N54 or N54/1
30.2		CAN element in engine control module (N3/11 or N3/12) Resistance	N3/11 N3/12 60 — 61	Ignition: **OFF** Disconnect connector 1 (interior) from engine control module (N3/11 or N3/12) and test directly at pins.	235 – 245 Ω	N3/11 or N3/12

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
31.0	P1 163	**Right engine control module (N3/12)** **Oil level switch (S43)**	N3/12 32 (1.32) — V — 25 (1.25)	Ignition: **ON** Oil level okay. Oil level low.	 11 – 14 V < 1 V	Wiring, S43
32.0	P1 177	**Oil temperature sensor (B1) to ME control module (N3/12)** Voltage	N3/12 87 (2.87) — V — 81 (2.81)	Ignition: **ON**	°C V 10 3.9 20 3.5 30 3.1 40 2.7 50 2.3 60 1.9 70 1.5 80 1.2 ±5 %	⇒ 32.1 N3/12
32.1		Oil temperature sensor (B1) Resistance	N3/12 87 (2.87) — V — 81 (2.81)	Ignition: **ON**	°C Ω 10 3807 20 2510 30 1722 40 1195 50 854 60 614 70 450 80 335 ±5 %	Wiring, B1

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
33.0		**Fuel consumption signal up to 05/96**	N3/12 25 (1.25) — V — 58 (1.58)	Engine: **idle, then briefly apply throttle.**	>0.5 V	Wiring, N3/12
34.0		**Diagnosis line** Activation	N3/11 N3/12 26 (1.26) — V — 55 (1.55)	Ignition: **ON**	11 – 14 V	Wiring, N3/11 or N3/12
35.0		**Only on left engine control module (N3/11)** **Coding**	N3/11 45 (1.45) — V — 25 (1.25)	Ignition: **ON**	11 – 14 V	Wiring.

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
36.0	P1 605	**Only on right engine control module (N3/12) until 05/96 (eliminated as of 06/96)** **Body acceleration sensor (B24/7)**				Wiring, ⇒ 36.1, B24/7
		Sensor signal in static state	N3/12 53 (1.53) — V — 48 (1.48)	Ignition: **ON**	2.35 – 2.65 V	
		Sensor signal in dynamic state	N3/12 53 (1.53) — V — 48 (1.48)	Vigorously move left front corner of vehicle by hand.	> 5 mV i Value changes with movement of vehicle.	
36.1		Voltage supply (B24/7)	N3/12 53 (1.53) — V — 44 (1.44)	Ignition: **ON**	4.7 – 5.3 V	N3/12
37.0	P1 437 P1 444	***Not applicable to U.S.A. version vehicles***				
37.1		*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
38.0		**Only model 140 on right engine control module (N3/12) until 05/96 (as of 06/96 via CAN)** (only USA) **Fuel tank cap open signal**	N3/12 23 (1.23) — V — 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, ⇒ 26.0
39.0		**Only on right engine control module (N3/12) until 05/96 (as of 06/96 via CAN)** (only USA) **"CHECK ENGINE" MIL (A1e26)**	N3/12 11 (1.11) — V — 25 (1.25)	Ignition: **ON**	11 – 14 V	N3/12
40.0		**Engine control module (ME-SFI) coding** Bridge	N3/11 N3/12 73 (2.73) — Ω — 96 (2.96)	Ignition: **OFF**	< 1 Ω	Wiring.

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
41.0		**Only model 129 on right engine control module (N3/12) (as of 06/98)** **Starter relay module (K38/1)** Activation	N3/12 104 (2.104) — 25 (1.25)	Starter switch in position 3 (start position): **Crank briefly:**	11 – 14 V or if engine does not start for approx. 5 seconds.	⇒ 41.1, N3/12
41.1		Starter signal, circuit 50	N3/12 38 (1.38) — 14 (1.14)	Ignition: **Start engine**	11 – 14 V during the start sequence.	Wiring, Ignition/starter switch

Electrical Test Program – Sequential Multiport Fuel Injection System Test

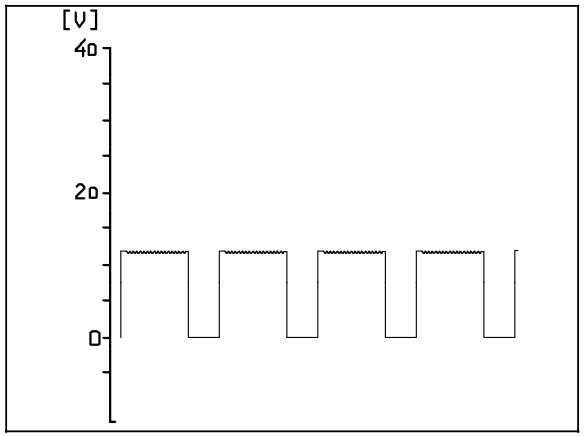


Figure 1
TN signal

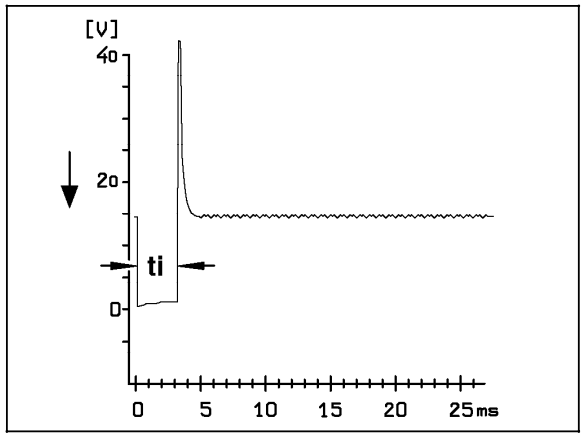


Figure 2
Injection duration “ti” at CTP

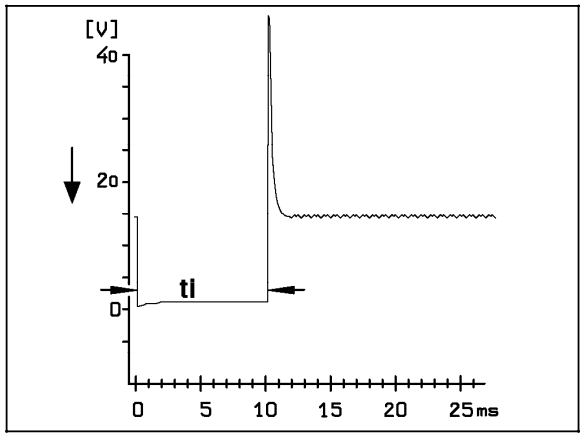


Figure 3
Injection duration “ti” at WOT

Electrical Test Program – Sequential Multiport Fuel Injection System Test

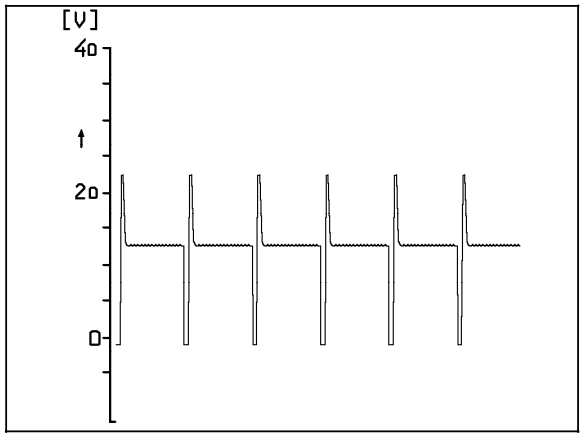


Figure 4

Purge control valve signal

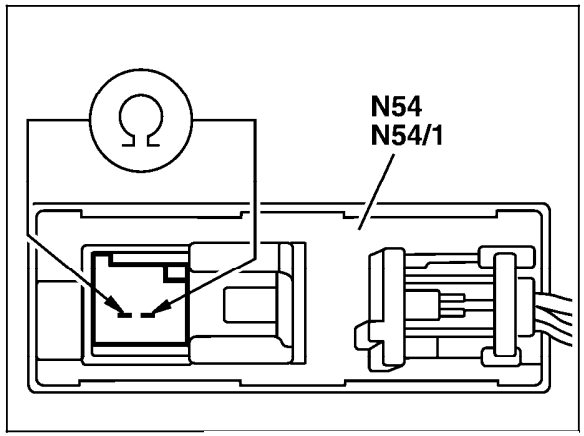


Figure 5

N54 RCL control module
N54/1 DAS control module

Electrical Test Program – Ignition System Test

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

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

⚠ **WARNING!**
Risk of explosion from fuel igniting, risk of poisoning from inhaling and swallowing fuel as well as risk of injury to eyes and skin from contact with fuel.
No fire, sparks, exposed flames or smoking.
Pour fuels only into suitable and appropriately marked containers.
Wear protective clothing when handling fuel.

Note regarding "Test Connection" column:
The numbers indicated in parentheses, for example, ⇒ 1.0 (2A) signify:
2 = Socket 2 on wiring diagram.
A = Connector A on wiring diagram

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

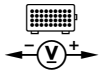
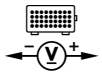
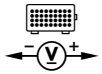
Preparation for Test:
1. Review section 0,
2. Review 11, 21, 22,
3. Ignition: **OFF,**
4. Connect test cable with socket box to N3/11 or N3/12, see 22.

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/remedy
1.0	P0 560 P1 587	**Left engine control module (N3/11) or Right engine control module (N3/12)** Voltage supply circuit 30	N3/11 N3/12 26 (1.26) — V — 35 (1.35)	Ignition: **ON**	11 – 14 V	⇒ 1.1

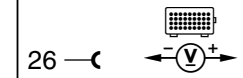
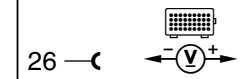
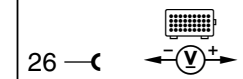
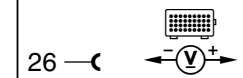
Electrical Test Program – Ignition System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/remedy
1.1		Ground wire	N3/11 N3/12 X11/4 26 — (V) — 2 (1.26) 39 — (V) — 2 (1.39)	Ignition: **ON**	11 – 14 V	Wiring, **Model 129** Ground (W27), module box bracket. **Model 140** Harness ground (W15), right footwell. ⇒ 1.2
1.2		Voltage supply circuit 30	N3/11 N3/12 X11/4 1 — (V) — 35 (1.35)	Ignition: **ON**	11 – 14 V	Wiring, Base module (BM) (N16/1) or fuse on N16/1
2.0	P0 560 P1 587	**Left engine control module (N3/11) or Right engine control module (N3/12)** Voltage supply circuit 87L	N3/11 N3/12 38 — (V) — 24 (1.38) (1.24)	Ignition: **ON**	11 – 14 V	⇒ 2.1

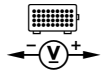
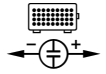
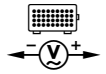
Electrical Test Program – Ignition System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/remedy
2.1		Electronics ground	N3/11 N3/12 38 — (1.38)  X11/4 — 2	Ignition: **ON**	11 – 14 V	Wiring, **Model 129 and 140** Electronics ground (W15/1), right footwell ⇒ 2.2
2.2		Voltage supply Circuit 87L	N3/11 N3/12 X11/4 1 —  — 24 (1.24)	Ignition: **ON** Ignition: **OFF**	11 – 14 V < 1 V	Wiring, Base module (N16/1) or fuse on base module, Ignition/starter switch (S2/1)
3.0	P0 560 P1 587	**Left engine control module (N3/11) or Right engine control module (N3/12)** Voltage supply circuit 87M1e	N3/11 N3/12 39 — (1.39)  — 36 (1.36)	Ignition: **ON** Ignition: **OFF**	11 – 14 V < 1 V	Wiring.
4.0		**Ignition coil (T1/1 or T1/7)** Voltage supply	N3/11 N3/12 26 — (1.26)  — 83 (2.83)	Ignition: **ON** Starter: **Crank**	11 – 14 V > 10 V	Wiring. Model 129 as of 09/95 and Model 140 as of 06/96 fused as follows: Model 129: fuse 34 Model 140: fuse 22

Electrical Test Program – Ignition System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/remedy
5.0		**Ignition coil (T1/2 or T1/8)** Voltage supply	N3/11 N3/12  26 (1.26) — 94 (2.94)	Ignition: **ON** Starter: **Crank**	11 – 14 V > 10 V	Wiring. Model 129 as of 09/95 and Model 140 as of 06/96 fused as follows: Model 129: fuse 34 Model 140: fuse 22
6.0		**Ignition coil (T1/3 or T1/9)** Voltage supply	N3/11 N3/12  26 (1.26) — 85 (2.85)	Ignition: **ON** Starter: **Crank**	11 – 14 V > 10 V	Wiring. Model 129 as of 09/95 and Model 140 as of 06/96 fused as follows: Model 129: fuse 34 Model 140: fuse 22
7.0		**Ignition coil (T1/4 or T1/10)** Voltage supply	N3/11 N3/12  26 (1.26) — 115 (2.115)	Ignition: **ON** Starter: **Crank**	11 – 14 V > 10 V	Wiring. Model 129 as of 09/95 and Model 140 as of 06/96 fused as follows: Model 129: fuse 34 Model 140: fuse 22
8.0		**Ignition coil (T1/5 or T1/11)** Voltage supply	N3/11 N3/12  26 (1.26) — 84 (2.84)	Ignition: **ON** Starter: **Crank**	11 – 14 V > 10 V	Wiring. Model 129 as of 09/95 and Model 140 as of 06/96 fused as follows: Model 129: fuse 34 Model 140: fuse 22

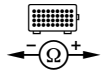
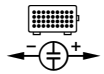
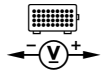
Electrical Test Program – Ignition System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/remedy
9.0		**Ignition coil (T1/6 or T1/12)** Voltage supply	N3/11 N3/12  26 (1.26) — 95 (2.95)	Ignition: **ON** Starter: **Crank**	11 – 14 V > 10 V	Wiring. Model 129 as of 09/95 and Model 140 as of 06/96 fused as follows: Model 129: fuse 34 Model 140: fuse 22
10.0	P0 335 P1 300	**Left CKP sensor (L5/4)** **Right CKP sensor (L5/5)**	N3/11 [2] N3/12 [2]  78 (2.78) — 89 (2.89)	Starter: **Crank** Engine: **at Idle**	Signal, see Figure 1.	⇒ 10.1, Teeth on starter ring gear.
			N3/11 [3] N3/12 [3]  78 (2.78) — 89 (2.89)	Starter: **Crank** Engine: **at Idle**	> 0.5 V > 7 V Increase in rpm = increase in voltage.	

[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
10.1		Resistance of CKP sensor (L5/4 or L5/5)	N3/11 N3/12  78 (2.78) — 89 (2.89)	Ignition: **OFF** Unplug connector 2 on engine control module (N3/11) or (N3/12).	(at 20°C): 600 – 1200 Ω	L5/4 or L5/5
11.0	P0 341 P1 397	**Left camshaft Hall-effect sensor (B6/2) or Right camshaft Hall-effect sensor (B6/3)** Hall-effect signal	N3/11 [2] N3/12 [2]  87 (2.87) — 66 (2.66)	Engine: **at Idle**	Signal, see Figure 2.	⇒ 11.1, B6/2 or B6/3
			N3/11 [3] N3/12 [3]  66 (2.66) — 25 (1.25)	Engine: **at Idle**	1.3 – 1.7 V Value changes	

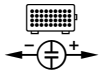
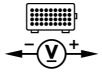
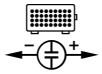
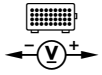
2) Test with oscilloscope.

3) Test with multimeter only if oscilloscope is unavailable.

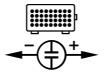
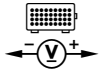
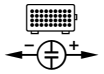
Electrical Test Program – Ignition System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/remedy
11.1		Voltage supply to camshaft Hall-effect sensor (B6/2 or B6/3)	B6/2 B6/3 1 — (V) — 3	Ignition: **ON** Disconnect connector from Hall-effect sensor (B6/2 or B6/3) and test directly on sockets 1 and 3 of connector.	11 – 14 V	Wiring.
12.0		**Closing duration for ignition coil (T1/1 or T1/7)**	N3/11 N3/12 83 (2.83) — 25 (1.25)	Starter: **Crank** Engine: **at Idle**	20 – 100 ms 2 – 4 ms	⇒ 10.0, ⇒ 12.1, N3/11 or N3/12
12.1		Rest current shut-off: T1/1 or T1/7	N3/11 N3/12 83 (2.83) — (V) — 25 (1.25)	Ignition: **ON** Starter: **Crank**	0 V 0.3 – 0.5 V	T1/1 or T1/7, N3/11 or N3/12, < 0.3 V: wire from T1/1 to N3/12 or T1/7 to N3/11 open circuit, > 0.5 V: T1/1 or T1/7

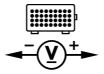
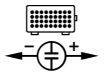
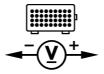
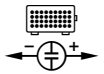
Electrical Test Program – Ignition System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/remedy
13.0		**Closing duration for ignition coil (T1/2 or T1/8)**	N3/11 N3/12  94 (2.94) — 25 (1.25)	Starter: **Crank** Engine: **at Idle**	20 – 100 ms 2 – 4 ms	⇒ 13.1, N3/11 or N3/12
13.1		Rest current shut-off: T1/2 or T1/8	N3/11 N3/12  94 (2.94) — 25 (1.25)	Ignition: **ON** Starter: **Crank**	0 V 0.3 – 0.5 V	T1/2 or T1/8, N3/11 or N3/12, < 0.3 V: wire from T1/2 to N3/12 or T1/8 to N3/11 open circuit, > 0.5 V: T1/2 or T1/8
14.0		**Closing duration for ignition coil (T1/3 or T1/9)**	N3/11 N3/12  85 (2.85) — 25 (1.25)	Starter: **Crank** Engine: **at Idle**	20 – 100 ms 2 – 4 ms	⇒ 14.1, N3/11 or N3/12
14.1		Rest current shut-off: T1/3 or T1/9	N3/11 N3/12  85 (2.85) — 25 (1.25)	Ignition: **ON** Starter: **Crank**	0 V 0.3 – 0.5 V	T1/3 or T1/9, N3/11 or N3/12, < 0.3 V: wire from T1/3 to N3/12 or T1/9 to N3/11 open circuit, > 0.5 V: T1/3 or T1/9

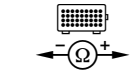
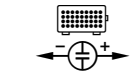
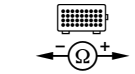
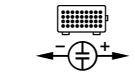
Electrical Test Program – Ignition System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/remedy
15.0		**Closing duration for ignition coil (T1/4 or T1/10)**	N3/11 N3/12  115 (2.115) — 25 (1.25)	Starter: **Crank** Engine: **at Idle**	20 – 100 ms 2 – 4 ms	⇒ 15.1, N3/11 or N3/12
15.1		Rest current shut-off: T1/4 or T1/10	N3/11 N3/12  115 (2.115) — 25 (1.25)	Ignition: **ON** Starter: **Crank**	0 V 0.3 – 0.5 V	T1/4 or T1/10, N3/11 or N3/12, < 0.3 V: wire from T1/4 to N3/12 or T1/10 to N3/11 open circuit, > 0.5 V: T1/4 or T1/10
16.0		**Closing duration for ignition coil (T1/5 or T1/11)**	N3/11 N3/12  84 (2.84) — 25 (1.25)	Starter: **Crank** Engine: **at Idle**	20 – 100 ms 2 – 4 ms	⇒ 16.1, N3/11 or N3/12

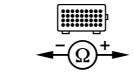
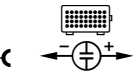
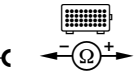
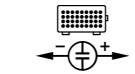
Electrical Test Program – Ignition System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/remedy
16.1		Rest current shut-off: T1/5 or T1/11	N3/11 N3/12  84 (2.84) — 25 (1.25)	Ignition: **ON** Starter: **Crank**	0 V 0.3 – 0.5 V	T1/5 or T1/11, N3/11 or N3/12, < 0.3 V: wire from T1/5 to N3/12 or T1/11 to N3/11 open circuit, > 0.5 V: T1/5 or T1/11
17.0		**Closing duration for ignition coil (T1/6 or T1/12)**	N3/11 N3/12  95 (2.95) — 25 (1.25)	Starter: **Crank** Engine: **at Idle**	20 – 100 ms 2 – 4 ms	⇒ 17.1, N3/11 or N3/12
17.1		Rest current shut-off: T1/6 or T1/12	N3/11 N3/12  95 (2.95) — 25 (1.25)	Ignition: **ON** Starter: **Crank**	0 V 0.3 – 0.5 V	T1/6 or T1/12, N3/11 or N3/12, < 0.3 V: wire from T1/6 to N3/12 or T1/12 to N3/11 open circuit, > 0.5 V: T1/6 or T1/12
18.0	P0 300 P0 301 P0 307	**Primary voltage** Ignition coil (T1/1 or T1/7)	N3/11 N3/12  83 (2.83) — 25 (1.25)	**Test connection Note:** Individual primary pattern Range 400 V Duration 100% Starter: **Crank**	200 – 350 V	⇒ 18.1, N3/11 or N3/12

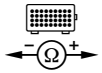
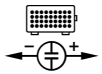
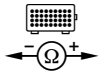
Electrical Test Program – Ignition System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/remedy
18.1		Primary winding of T1/1 and T1/2 or T1/7 and T1/8	N3/11 N3/12  83 (2.83) — 94 (2.94)	Ignition: **OFF**	0.9 – 1.4 Ω The resistance of a single coil is 0.5 – 0.7Ω	T1/1 or T1/2 and/or T1/7 or T1/8
19.0	P0 300 P0 302 P0 308	**Primary voltage** Ignition coil (T1/2 or T1/8)	N3/11 N3/12  94 (2.94) — 25 (1.25)	**Test connection Note:** Individual primary pattern Range 400 V Duration 100% Starter: **Crank**	200 – 350 V	⇒ 19.1, N3/11 or N3/12
19.1		Primary winding of T1/2 and T1/1 or T1/8 and T1/7	N3/11 N3/12  94 (2.94) — 83 (2.83)	Ignition: **OFF**	0.9 – 1.4 Ω The resistance of a single coil is 0.5 – 0.7Ω	T1/2 or T1/1 and/or T1/8 or T1/7
20.0	P0 300 P0 303 P0 309	**Primary voltage** Ignition coil (T1/3 or T1/9)	N3/11 N3/12  85 (2.85) — 25 (1.25)	**Test connection Note:** Individual primary pattern Range 400 V Duration 100% Starter: **Crank**	200 – 350 V	⇒ 20.1, N3/11 or N3/12

Electrical Test Program – Ignition System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/remedy
20.1		Primary winding of T1/3 and T1/4 or T1/9 and T1/10	N3/11 N3/12  85 (2.85) 115 (2.115)	Ignition: **OFF**	0.9 – 1.4 Ω The resistance of a single coil is 0.5 – 0.7Ω	T1/3 or T1/4 and/or T1/9 or T1/10
21.0	P0 300 P0 304 P0 310	**Primary voltage** Ignition coil (T1/4 or T1/10)	N3/11 N3/12  115 (2.115) 25 (1.25)	**Test connection Note:** Individual primary pattern Range 400 V Duration 100% Starter: **Crank**	200 – 350 V	⇒ 21.1, N3/11 or N3/12
21.1		Primary winding of T1/4 and T1/3 or T1/10 and T1/9	N3/11 N3/12  115 (2.115) 85 (2.85)	Ignition: **OFF**	0.9 – 1.4 Ω The resistance of a single coil is 0.5 – 0.7Ω	T1/4 or T1/3 and/or T1/10 or T1/9
22.0	P0 300 P0 305 P0 311	**Primary voltage** Ignition coil (T1/5 or T1/11)	N3/11 N3/12  84 (2.84) 25 (1.25)	**Test connection Note:** Individual primary pattern Range 400 V Duration 100% Starter: **Crank**	200 – 350 V	⇒ 22.1, N3/11 or N3/12

Electrical Test Program – Ignition System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/remedy
22.1		Primary winding of T1/5 and T1/6 or T1/11 and T1/12	N3/11 N3/12  84 (2.84) — 95 (2.95)	Ignition: **OFF**	0.9 – 1.4 Ω The resistance of a single coil is 0.5 – 0.7Ω	T1/5 or T1/6 and/or T1/11 or T1/12
23.0	P0 300 P0 306 P0 312	**Primary voltage** Ignition coil (T1/6 or T1/12)	N3/11 N3/12  95 (2.95) — 25 (1.25)	**Test connection Note:** Individual primary pattern Range 400 V Duration 100% Starter: **Crank**	200 – 350 V	⇒ 23.1, N3/11 or N3/12
23.1		Primary winding of T1/6 and T1/5 or T1/12 and T1/11	N3/11 N3/12  95 (2.95) — 84 (2.84)	Ignition: **OFF**	0.9 – 1.4 Ω The resistance of a single coil is 0.5 – 0.7Ω	T1/6 or T1/5 and/or T1/12 or T1/11

Electrical Test Program – Ignition System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/remedy
24.0	P0 300 P0 301 P0 302 P0 303 P0 304 P0 305 P0 306 P0 307 P0 308 P0 309 P0 310 P0 311 P0 312	**Firing voltage** Ignition coil (T1/1) to (T1/12)	Engine analyzer	**Test connection Note:** Individual secondary pattern Range 20 kV Duration 100% Connect kV pick-ups successively to T1/1 through T1/12. Starter: **Crank**	8 – 20 kV The resistance of the secondary winding can not be measured due to an installed diode.	Spark plugs, T1/1 to T1/12, N3/11 or N3/12

Electrical Test Program – Ignition System Test

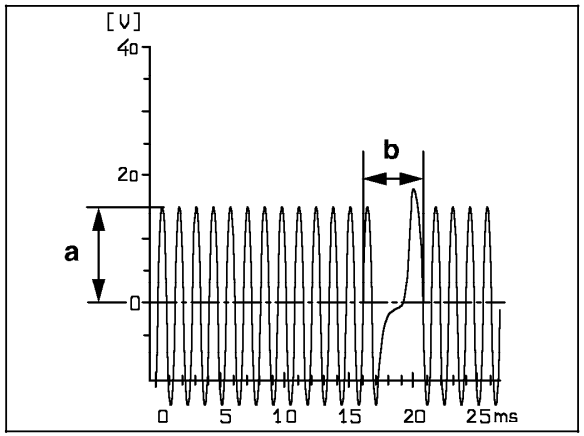


Figure 1

Left CKP sensor (L5/4) and Right CKP sensor (L5/5) signal a=voltage, b=2 missing teeth for cylinder 1 or cylinder 7 recognition

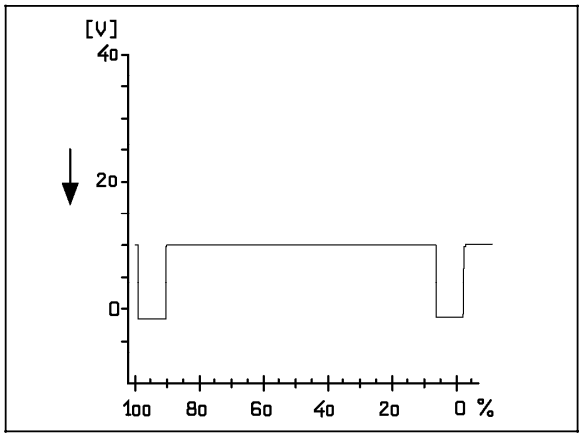
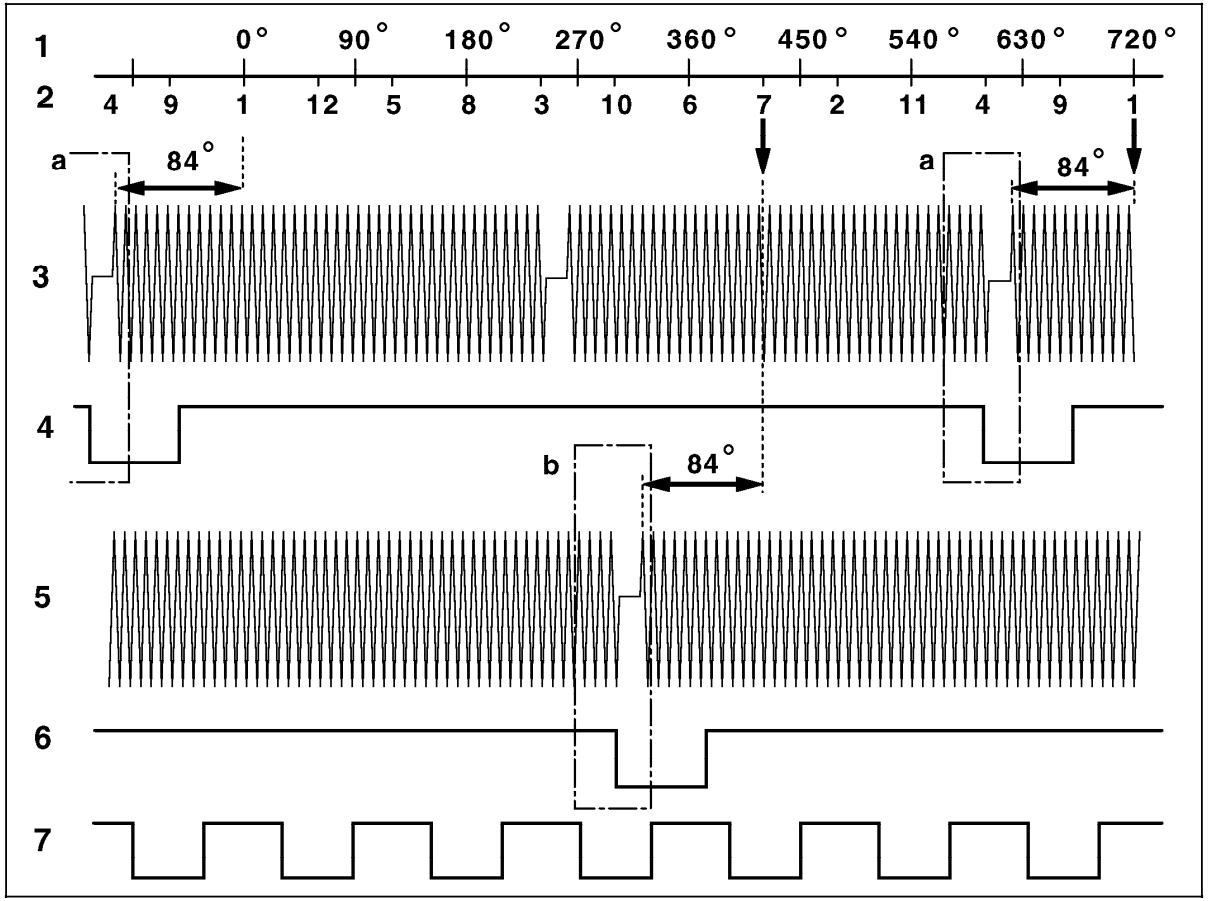


Figure 2

Left camshaft Hall-effect sensor (B6/2) and Right camshaft Hall-effect sensor (B6/3) signal

Electrical Test Program – Ignition System Test

Signal survey



P07.61-0231-06

Figure 3

1 Crank angle (CKA)
2 Cylinder
3 Right CKP sensor (L5/5) signal
4 Right camshaft Hall-effect sensor (B6/3) signal
5 Left CKP sensor (L5/4) signal
6 Left camshaft Hall-effect sensor (B6/2) signal
7 Engine rpm signal TNA
a Cylinder 1 recognition
b Cylinder 7 recognition

Electrical Test Program – Electronic Accelerator (EA) Test

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

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

⚠ WARNING!
Risk of explosion from fuel igniting, risk of poisoning from inhaling and swallowing fuel as well as risk of injury to eyes and skin from contact with fuel.
No fire, sparks, exposed flames or smoking.
Pour fuels only into suitable and appropriately marked containers.
Wear protective clothing when handling fuel.

Note regarding "Test Connection" column:
The numbers indicated in parentheses, for example, ⇒ 1.0 (2A) signify:
2 = Socket 2 on wiring diagram.
A = Connector A on wiring diagram

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

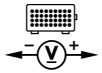
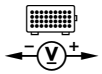
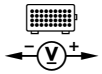
Preparation for Test:
1. Review section 0,
2. Review 11, 21, 22,
3. Ignition: **OFF,**
4. Connect test cable with socket box to N3/11 or N3/12, see 22.

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
1.0	P1 587 P0 560	**Left engine control module (N3/11) or Right engine control module (N3/12)** Voltage supply Circuit 30	N3/11 N3/12 26 (1.26) — V — 35 (1.35)	Ignition: **ON**	11 – 14 V	⇒ 1.1

Electrical Test Program – Electronic Accelerator (EA) Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
1.1		Ground wire	N3/11 N3/12 X11/4 26 — (1.26) — V — 2 39 — (1.39) — V — 2	Ignition: **ON**	11 – 14 V	Wiring, **Model 129:** Ground (W27), module box bracket. **Model 140:** Harness ground (W15), right footwell. ⇒ 1.2
1.2		Voltage supply Circuit 30	N3/11 N3/12 X11/4 1 — V — 35 (1.35)	Ignition: **ON**	11 – 14 V	Wiring, Base module (N16/1) or fuse on base module,
2.0	P1 587 P0 560	**Left engine control module (N3/11) or Right engine control module (N3/12)** Voltage supply Circuit 87L	N3/11 N3/12 38 (1.38) — V — 24 (1.24)	Ignition: **ON**	11 – 14 V	⇒ 2.1

Electrical Test Program – Electronic Accelerator (EA) Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
2.1		Electronic ground	N3/11 N3/12 38 — (1.38)  X11/4 — 2	Ignition: **ON**	11 – 14 V	Wiring, **Model 129, 140:** Electronics ground (W15), right footwell. ⇒ 2.2
2.2		Voltage supply Circuit 87L	N3/11 N3/12 X11/4 1 —  — 24 (1.24)	Ignition: **ON** Ignition: **OFF**	11 – 14 V <1 V	Wiring, Base module (N16/1) or fuse on base module, Ignition/starter switch (S2/1).
3.0	P1 587 P0 560	**Left engine control module (N3/11) or Right engine control module (N3/12)** Voltage supply Circuit 87M1e	N3/11 N3/12 39 — (1.39)  — 36 (1.36)	Ignition: **ON** Ignition: **OFF**	11 – 14 V <1 V	Wiring.

Electrical Test Program – Electronic Accelerator (EA) Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
4.0	P1 542 P0 507	**Only RIGHT engine control module (N3/12)** **Pedal value sensor (B37)** Signal Nominal value potentiometer 1	N3/12 18 (1.18) — V — 19 (1.19)	Ignition: **ON** Accelerator pedal position: CTP: WOT:	 0.2 – 0.5 V 4.3 – 4.8 V	Wiring, ⇒ 4.1, B37
4.1		Voltage supply Nominal value potentiometer 1	N3/12 18 (1.18) — V — 17 (1.17)	Ignition: **ON**	4.75 – 5.25 V	N3/12
5.0	P1 542 P0 507	**Only LEFT engine control module (N3/11)** **Pedal value sensor (B37)** Signal Nominal value potentiometer 2	N3/11 18 (1.18) — V — 19 (1.19)	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	N3/11 18 (1.18) — V — 4 (1.4)	Ignition: **ON**	2.25 – 2.75 V	N3/11

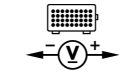
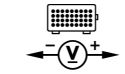
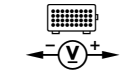
Electrical Test Program – Electronic Accelerator (EA) Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
6.0	P0 507 P0 120 P1 162 P1 186	**Right EA/CC/ISC actuator (M16/3) or Left EA/CC/ISC actuator (M16/4)** Signal Actual value potentiometer 1	N3/11 N3/12 98 — (2.98) — (V) — 97 (2.97)	Ignition: **ON** Accelerator pedal position: CTP: WOT:	 4.0 – 4.6 V < CTP value	Wiring, ⇒ 6.1, M16/4 or M16/3
		Actual value potentiometer 2	N3/11 N3/12 98 — (2.98) — (V) — 107 (2.107)	Accelerator pedal position: CTP: WOT:	 0.3 – 0.9 V > CTP value	
6.1		Voltage supply Actual value potentiometers 1 and 2	N3/11 N3/12 98 — (2.98) — (V) — 106 (2.106)	Ignition: **ON**	4.75 – 5.25 V	N3/11 or N3/12

Electrical Test Program – Electronic Accelerator (EA) Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
7.0	P1 186 P1 580 P1 581	**Right EA/CC/ISC actuator (M16/3) or Left EA/CC/ISC actuator (M16/4)** Activation of actuator motor	N3/11 N3/12 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, M16/3 or M16/4. N3/11 or N3/12
		Resistance of actuator motor	N3/11 N3/12 74 (2.74) — Ω — 75 (2.75)	Ignition: **OFF**	< 10 Ω	
8.0	P0 500	**Only right engine control module (N3/12) (up to 05/98) (as of 06/98 via CAN)** **Left front axle VSS sensor (L6/1)**	N3/12 38 (1.38) — V — 9 (1.9)	Raise front of vehicle. Ignition: **ON** Spin left front wheel by hand.	4 – 8 V	Wiring, ESP see DM, Chassis & Drivetrain, Vol. 3, section 9 (ASR, ETS, ESP)
9.0	P0 500	**Only right engine control module (N3/12) (up to 05/98) (as of 06/98 via CAN)** **Left rear axle VSS sensor (L6/3)**	N3/12 38 (1.38) — V — 22 (1.22)	Raise rear of vehicle. Ignition: **ON** Spin left rear wheel by hand.	4 – 8 V	Wiring, 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
10.0	P0 507 P1 641	**CTP (idle) signal**	N3/11 N3/12  38 (1.38) — 16 (1.16)	Ignition: **ON** Accelerator pedal position: CTP: WOT:	 > 4.0 V 2.0 – 3.0 V	Wiring, N3/11 or N3/12
11.0		**Only on RIGHT engine control module (N3/12) (up to 05/96) (as of 06/96 via CAN)** **A/C compressor signal**	N3/12  38 (1.38) — 8 (1.8)	Engine: **at Idle** Turn A/C system ON, move temperature selector wheel to MIN, blower set to AUTO.	< 1.0 V 11 – 14 V	Wiring, A/C pushbutton control module (N22).
12.0		**Only on RIGHT engine control module (N3/12) (up to 05/96)** **EPC MIL (A1e43)** Activation	N3/12  21 (1.21) — 35 (1.35)	Ignition: **ON** Engine: **at Idle**	11 – 14 V < 1.0 V	Wiring, Malfunction in actuators or pedal value sensor, N3/12

Electrical Test Program – Electronic Accelerator (EA) Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
13.0		**Only on LEFT engine control module (N3/11)** **Coding**	N3/11 45 — (1.45) — (V) — 25 (1.25)	Ignition: **ON**	11 – 14 V	Wiring.
14.0		**Ground bridge**	N3/11 N3/12 73 — (2.73) — (Ω) — 96 (2.96)	Ignition: **OFF**	< 1 Ω	Wiring.
15.0	P0 600 P1 570 P1 588 P1 641 P1 747	**CAN data bus**	N3/11 N3/12 60 — (1.60) — (Ω) — 61 (1.61)	Ignition: **OFF** Disconnect connector 1 from test cable and test directly at connector 1 of engine wiring harness using an ohmmeter, See 22	75 – 85 Ω	⇒ 15.1, ⇒ 15.2, Data line.

Electrical Test Program – Electronic Accelerator (EA) Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
15.1		Model 129/140 up to 05/96 CAN element in RCL control module (N54) Resistance Model 129/140 as of 06/96 CAN element in DAS control module (N54/1) Resistance	N54 N54/1  L H	Ignition: **OFF** Disconnect control module (N54 or N54/1) and test directly at control module.	115 – 125 Ω	N54 or N54/1
15.2		CAN element in engine control module (N3/11 or N3/12) Resistance	N3/11 N3/12  60 61	Ignition: **OFF** Disconnect connector 1 from control module (N3/11 or N3/12) and test directly at control module.	235 – 245 Ω	N3/11 or N3/12

Electrical Test Program – Cruise Control (CC) Test

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

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

⚠ WARNING!
Risk of explosion from fuel igniting, risk of poisoning from inhaling and swallowing fuel as well as risk of injury to eyes and skin from contact with fuel.
No fire, sparks, exposed flames or smoking.
Pour fuels only into suitable and appropriately marked containers.
Wear protective clothing when handling fuel.

Note regarding "Test Connection" column:
The numbers indicated in parentheses, for example, ⇒ 1.0 (2A) signify:
2 = Socket 2 on wiring diagram.
A = Connector A on wiring diagram

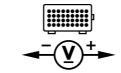
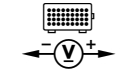
Connect interior harness connector to connection 1 on test cable.
Connect engine harness connector to connection 2 on test cable.

Preparation for Test:
1. Review section 0,
2. Review 11, 21, 22,
3. Ignition: **OFF,**
4. Connect test cable with socket box to N3/11 or N3/12, see 22.

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	
		SP Memory recall	N3/10			
			26 (1.26) — V — 30 (1.30)	Memory activated.	11 – 14 V	
		B Accelerate/set	N3/10			
			26 (1.26) — V — 2 (1.2)	Accelerate activated.	11 – 14 V	
		A Off	N3/10	CC switch not activated.	11 – 14 V	
			38 (1.38) — V — 28 (1.28)	Off activated.	< 1 V	
		Control contact	N3/10			
				CC switch not activated.	< 1 V	
			38 (1.38) — V — 27 (1.27)	CC switch in position: **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.C. contact	N3/12  1 (1.1) — 26 (1.26)	Ignition: **ON** Brake pedal not applied. Brake pedal applied.	< 1 V 11 – 14 V	Wiring, S9/1
2.1		N.O. contact	N3/12  26 (1.26) — 3 (1.3)	Ignition: **ON** Brake pedal not applied. Brake pedal applied.	11 – 14 V < 1 V	Wiring, S9/1

Electrical Test Program – Cruise Control (CC) Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
3.0	P0 500	**Only on RIGHT engine control module (N3/12) (up to 05/98) (as of 06/98 via CAN)** **Left front VSS signal**	N3/11 38 (1.38) — V — 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).
3.1	P0 500	Only on RIGHT engine control module (N3/12) (up to 05/98) (as of 06/98 via CAN) Left rear VSS signal	N3/11 38 (1.38) — V — 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)

⚠ **WARNING!**
Risk of severe injury when touching ignition parts which produce high voltages. Do not touch igntion components.

Persons with heart pacemakers are not to perform repairs on this type of ignition system..

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

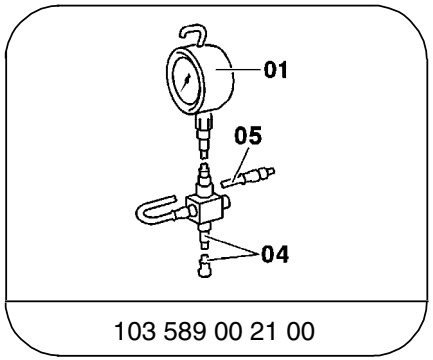
⚠ **WARNING!**
Risk of explosion from fuel igniting, risk of poisoning from inhaling and swallowing fuel as well as risk of injury to eyes and skin from contact with fuel.
No fire, sparks, exposed flames or smoking.
Pour fuels only into suitable and appropriately marked containers.
Wear protective clothing when handling fuel.

Preparation for Test

1. Review 11, 21, 22, 23, 24, 31, 33,
2. Review section 0,
3. Connect pressure gauge to test connection.
4. After completing test, using measurement glass (055), release fuel pressure and allow residual fuel to drain into glass (see Figure 1).

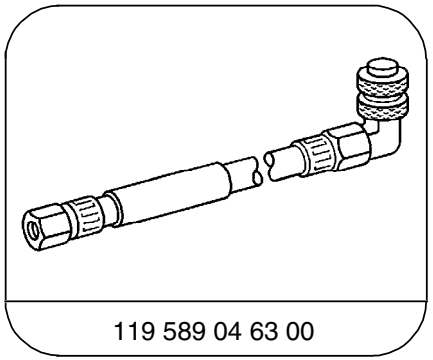
Hydraulic Test Program – Preparation for Test (Fuel System Pressure and Internal Leakage Test)

Special Tools



103 589 00 21 00

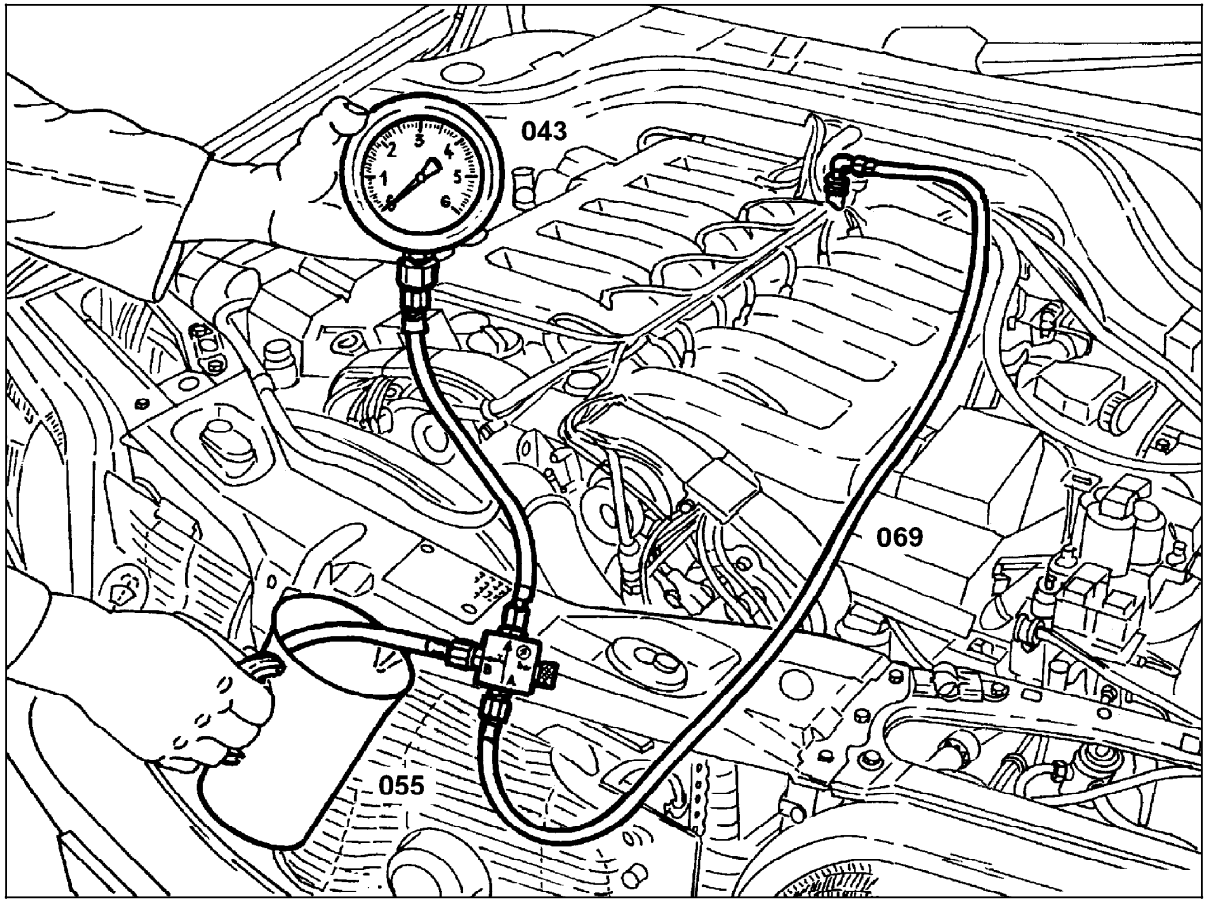
Tester



119 589 04 63 00

Pressure hose

Connection Diagram



P07.61-2059-06

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: 34 ⇒ 1.0, 34 ⇒ 2.0, 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 internal 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 ⇒ 1.0, 36 ⇒ 2.0, 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

1. Review 32,
2. Connect test cable with socket box to right engine control module (N3/12).

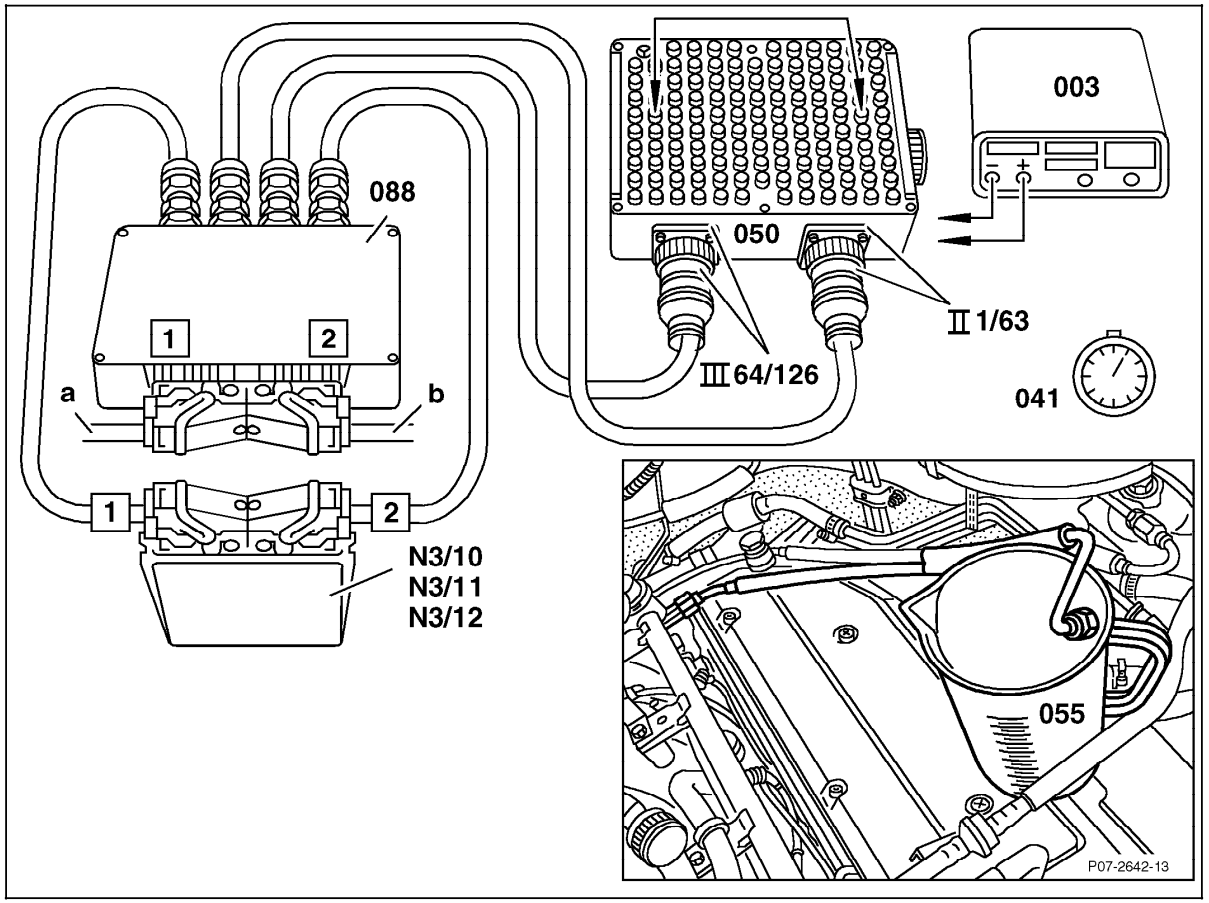


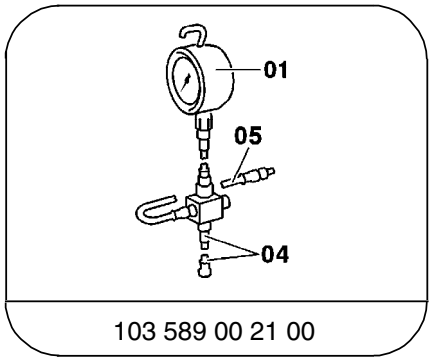
Figure 1

003 Digital multimeter
041 Stop watch
050 Socket box tester, 126 pole
055 Measuring glass
088 Test cable
a Interior wiring harness
b Engine compartment wiring harness
N3/11 Left engine control module (ME-SFI)
N3/12 Right engine control module (ME-SFI)
III64/126
and
II1/63: Connection descriptions on socket box and test cable

P07.61-2050-06

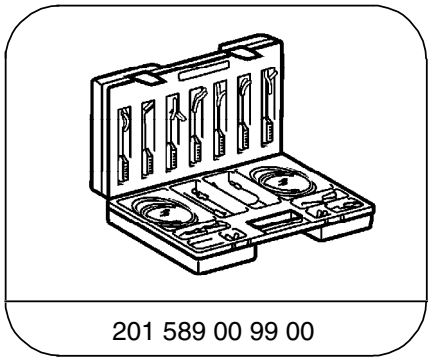
Hydraulic Test Program – Preparation forTest (Fuel Pump Test)

Special Tools



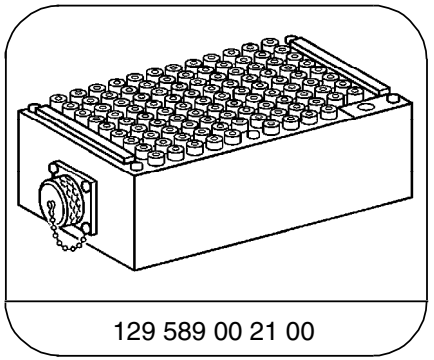
103 589 00 21 00

Tester



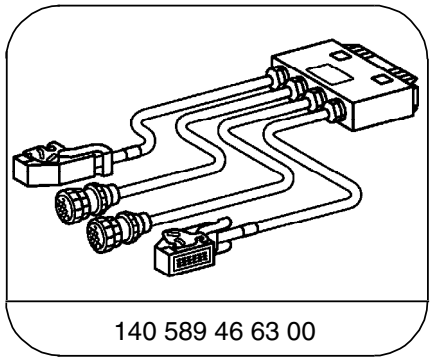
201 589 00 99 00

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
Measuring glass (1 liter minimum)	Local purchase
Stop watch	Local purchase

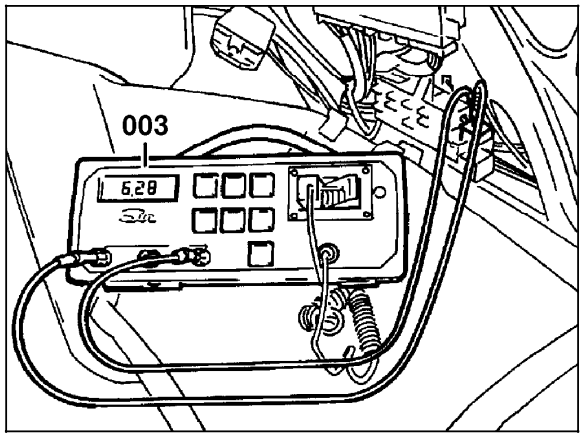
1) Available through the MBUSA Standard Equipment Program.

Hydraulic Test Program – Test (Fuel Pump Test)

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy [1]
1.0		**Right engine control module (ME-SFI) (N3/12) (only)** **Fuel pumps** Delivery capacity	N3/12  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		Disconnect fuel pump relay module (K27) and connect multimeter to sockets 1 and 3, see Figure 1 Ignition: **ON**	4 – 9 A	Fuel pumps.

[1] Observe Preparation for Test, see 33.

Hydraulic Test Program – Test (Fuel Pump Test)



P07.61-0579-01

Figure 1
003 Multimeter

Hydraulic Test Program – Preparation for Test (Injector Test)

Preparation for Test

1. Review section 0,
2. Review 11, 21, 22, 23, 24, 31, 33,
3. Connect socket box tester to engine control module (N3/12).
4. Fabricate test harness (O48) (see WF58.50-P-0761-01A).
5. Disconnect 2-pole connectors on injectors.
6. Remove fuel rail with injectors, thereby **not** disconnecting the fuel feed and return lines.
7. Connect self-made harness (048) to each injector one after another.
8. Hold each injector in measuring glass one after another.

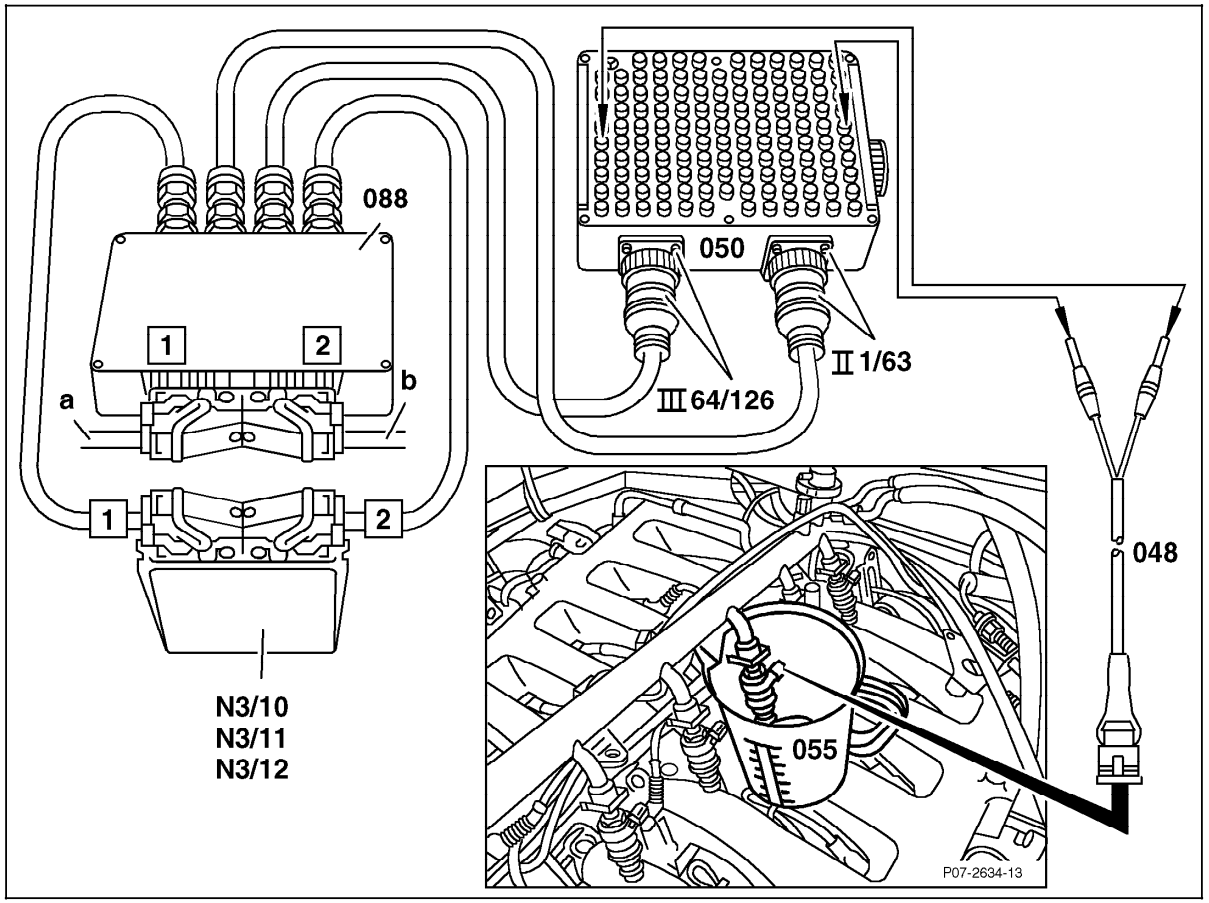


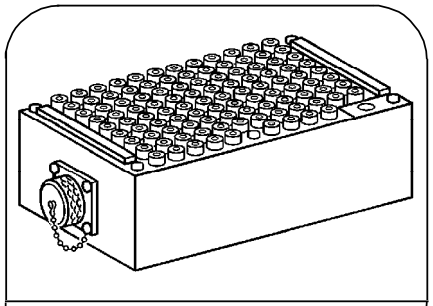
Figure 1

048 Self made harness
050 Socket box tester, 126 pole
055 Measuring glass
088 Test cable
N3/12 Right engine control module (ME-SFI)
III64/126
and
II1/63: Connection description on socket box and test cable

P07.61-2051-06

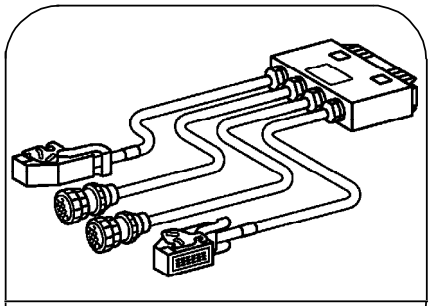
Hydraulic Test Program – Preparation for Test (Injector Test)

Special Tools



129 589 00 21 00

126-pin socket box



140 589 46 63 00

Test cable, 117-pin

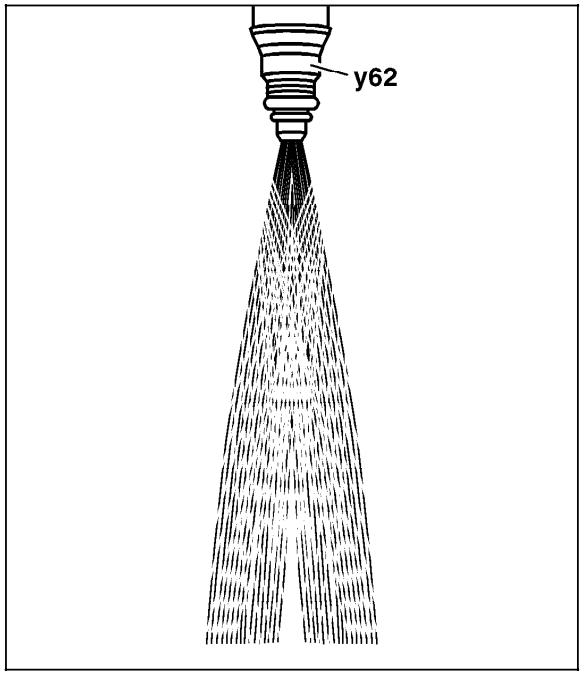
Conventional tools, test equipment

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

Hydraulic Test Program – Test (Injector Test)

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
1.0		**Injectors** Leakage test	N3/12 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	N3/12 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)



P07.61-0542-02

Figure 1

Y62 Injector
Good spray pattern