

3.1 Engine 606, Model 210 as of production start-up to 5/96

Page

Diagnosis

Diagnostic Trouble Code (DTC) Memory	11/1
Complaint Related Diagnostic Chart (Preglow System)	12/1
Table of Diagnostic Trouble Code Descriptions	13/1

Electrical Test Program

Component Locations	21/1
Preparation for Test	22/1
Test	23/1
Test (Preglow System)	24/1
Vacuum Line Routing	31/1

Diagnosis - Diagnostic Trouble Code (DTC) Memory

Note regarding diagnostic trouble code (DTC) readout:

- DTC memory: Fault display
 - Actual faults:** are on a **grey** background
 - Stored faults:** are on a **light** background

The signal plausibility is checked on all input and output connections during operation.

All malfunctions which occur are stored in the diagnostic trouble code memory of the IFI control module (N3/7).

The DTC memory remains active even if the ignition is turned "OFF" or the vehicle's battery is disconnected.

With emission related faults the CHECK ENGINE MIL (A1e26) lights up and/or the multifunction indicator displays: CHECK ENGINE
 ENGINE ELECTRONICS.

The faults are identified with an OBD failure code: See listing starting on page 5.

Such faults are for example:

- EGR lifting sender (B28/3)
- EGR valve vacuum transducer (Y31/1)
- Pressure control flap vacuum transducer (Y31/2)

Fault freeze frame data

Additionally, ambient conditions present at the time the fault occurs, can be displayed with the HHT. Only those freeze frame data are stored which were present when the fault first occurred. The freeze frame data may be indicated on several screen displays (up to 8 screen displays). The last two screen displays are for development purposes only.

Screen displays with the result √/F indicate the cause of the fault e.g.

- Voltage too high
- Voltage too low
- Signal too large
- Signal too small
- Value implausible

Substitution for missing signals.

The IFI control module (N3/7) replaces missing input signals with substitute values based on other signals available in order to maintain system function.

The substitute values may result in:

- Performance reduction/reduction of maximum engine rpm.
- Switching off anti-vibration control.
- EGR system malfunction.
- Cruise control malfunction.
- Intake MAP control malfunction.

Diagnosis - Diagnostic Trouble Code (DTC) Memory

Notes for 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 actual DTC's.
- Nominal values
All nominal values relative to the actual values shown on the HHT are listed in the Diagnostic Manual, Diesel Engines, Volume 1.1, section A.
- Actual value for engine coolant temperature
In case of an open or short circuit, the actual value is immediately replaced by a substitute value which is very close to the actual value. Therefore, a fault can not be recognized clearly. A readout of the fault is possible only via the diagnostic trouble code (DTC) memory.
- Actual value for engine rpm
In case of the engine rpm's, the HHT display indicates under menu selection 3/1 the closed throttle (idle) speed nominal value calculated by the control module on the left and the rpm actual value on the right.
- Actual value for injection quantity
In case of the injection quantity, the HHT display indicates under menu selection 3/2 engine test the injection quantity nominal value calculated by the control module on the left and the injection quantity actual value on the right.
- Actual value for intake manifold pressure
In case of the intake manifold pressure, the HHT display indicates under menu selection 3/2 engine test the intake manifold pressure nominal value calculated by the control module on the left and the intake manifold pressure actual value on the right.
The values should differ from each other only slightly. The permissible tolerances are presently unknown.

Notes regarding the Drive Authorization System Stage 2 (DAS)

- The activation of the drive authorization system stage 2 takes place only from the RCL control module via the CAN data bus to the IFI control module.
After activation of the DAS, the IFI control module renders the fuel injection system inoperable. This drive authorization system can only be activated or de-activated using either the IR transmitter or the master key.
The IFI control module and the RCL control module are permanently matched to one another via an identification code. This identification code can not be erased (see HHT actual value "drive authorization system" menu selection 3/7).
Troubleshooting of an IFI control module or the RCL control module by swapping control modules from another vehicle is no longer possible. If a new IFI control module is installed for test purposes only, a maximum of 40 engine starts can be performed before the control modules are permanently locked with each other. **After 40 engine starts, the IFI control module can no longer be used in any other vehicle.**
Before the first engine start, version coding must be performed on the IFI control module with the HHT. After that, identification must be initiated.

Diagnosis - Diagnostic Trouble Code (DTC) Memory

Version coding with HHT

- a) Version coding can be performed automatically and manually only with the Hand-Held Tester (see menu selection 5 "Version coding").
- **Automatic**
Before removing the IFI control module, read existing version code with HHT. After installation of the new control module, enter the previously read version code (menu program in HHT).
 - **Manual**
If the code number can **not** be read, the vehicle equipment/version must be determined. The corresponding code number is obtained from the Spare Parts Microfiche, Group 54 and manually entered with the HHT.

The following vehicle version data must be observed for coding:

- Vehicle model
- ABS
- Manual transmission
- 4-speed automatic transmission
- With cruise control
- Without cruise control
- ETS
- Country version

When returning a new control module to a PDC, the code number must be erased.

Trial installation of a control module from an other vehicle is **not** possible. Trial installation of a new control module from spare parts stock is possible, but only to a maximum of 40 engine starts. After 40 engine starts, the control module is permanently assigned to the vehicle.

Operating Cycle version only

One operating cycle is reached if:

- Engine coolant temperature > 60° C
- Engine rpm for 5 seconds at 2500 rpm
- Ignition **OFF** for 5 seconds
- Engine rpm for 5 seconds at 2500 rpm
- Ignition **OFF** for 5 seconds
- Engine rpm for 5 seconds at 2500 rpm

See HHT Menu 3/8 Memory storage enablement OBD II.

Diagnosis - Diagnostic Trouble Code (DTC) Memory


Prerequisite for DTC memory readout

1. Fuse on relay module (K40) in order.
2. Connect HHT to data link connector (X11/4, 38-pole) according to connection diagram (see section 0).
Yellow wire to socket 4.

Electrical wiring diagram:

Electrical Troubleshooting Manual, Model 210


Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC 	OBD DTC	Possible cause	DTC Description	Test step/Remedy ¹⁾
		No malfunction in system		–
P0105	P0105	Pressure sensor (B28)	13 \geq 1	23 \Rightarrow 6.0
P0110	P0111	IAT sensor (B17)	13 \geq 2	23 \Rightarrow 5.0
P0115	P0115	ECT sensor (B11/4)	13 \geq 3	23 \Rightarrow 4.0
P0180	P0181	Fuel temperature sensor (Y1/1b1)	13 \geq 4	23 \Rightarrow 23.0
P0400	P0400	EGR, Pressure control, intake manifold pressure	13 \geq 5	23 \Rightarrow 31.0
P0500		VSS		23 \Rightarrow 15.0
P0600	²⁾	CAN data bus		23 \Rightarrow 25.0
P0703		Stop lamp switch (S9/1)		23 \Rightarrow 12.0 + 13.0
P1105	P0106	Atmospheric pressure sensor in control module	13 \geq 6	N3/7
P1220	P0200	Fuel quantity actuator (IFI) (Y23/1)	13 \geq 7	23 \Rightarrow 8.0
P1222	P0220	IFI accelerator pedal position sensor (R25/2)	13 \geq 8	23 \Rightarrow 10.0

1) Observe Preparation for Test, see 22.


2) The DTC P0600 can be displayed even if no malfunction is present

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC 	OBD DTC	Possible cause		Test step/Remedy ¹⁾
P1223	P0200	Fuel rack position sensor (Y23/111)	13 \geq 9	23 \Rightarrow 9.0
P1335	P0725	CKP sensor (IFI) (L5/6)	13 \geq 10	23 \Rightarrow 7.0
P1401	P0403	EGR lifting sender (B28/3)	13 \geq 11	23 \Rightarrow 30.0
P1470	P0120	Pressure control flap vacuum transducer (Y31/2)	13 \geq 12	23 \Rightarrow 32.0
P1475	P0200	Resonance intake line switchover valve (Y22/7)	13 \geq 13	23 \Rightarrow 26.0
P1476	P0200	Resonance intake manifold switchover valve (Y22/6)	13 \geq 14	23 \Rightarrow 27.0
P1480	P0380	Preglow control	13 \geq 15	24 \Rightarrow 1.0 – 4.0
P1520		Cruise control switch (S40)		23 \Rightarrow 16.0
P1610		Voltage supply missing or relay module (K40)		23 \Rightarrow 3.0
P1611	P0200	IFI control module (N3/7)	13 \geq 16	N3/7
P1612		IFI control module (N3/7) voltage, circuit 15	13 \geq 17	23 \Rightarrow 2.0
P1613	P0200	IFI control module (N3/7)	13 \geq 18	N3/7
P1614	P0200	IFI control module (N3/7) or fuel metering actuator (Y23/1k1) or fuel rack position sensor (Y23/111)	13 \geq 19	23 \Rightarrow 8.0 + 9.0
P1615	P0560	IFI control module (N3/7) supply voltage	13 \geq 20	23 \Rightarrow 1.0

¹⁾ Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC 	OBD DTC	Possible cause		Test step/Remedy ¹⁾
P1617	P0200	Control module or not coded	13 \geq 21	see HHT “version coding” menu selection 5
P1622	P0200	Electrohydraulic shut-off actuator (Y1/1)	13 \geq 22	23 \Rightarrow 22.0
P1625		CHECK ENGINE MIL		23 \Rightarrow 17.0
P1630		Drive authorization signal		see section A4 or HHT actual values “drive authorization” menu selection 3/7
P1705		Starter lock-out/backup lamp switch (S16/1)		23 \Rightarrow 11.0 + 29.0
P1780		Modulating pressure switchover valve (AT/CC) (Y3/4) or upshift delay switchover valve (AT/CC) (Y3/5)		23 \Rightarrow 19.0 + 21.0
P1781		Upshift delay switchover valve (AT/CC) (Y3/5)		23 \Rightarrow 21.0

¹⁾ Observe Preparation for Test, see 22.

Diagnosis – Complaint Related Diagnostic Chart (Preglow System)

Complaint/Problem	Possible cause	Test step/Remedy ¹⁾
Preglow indicator lamp does not light with glow/starter switch ON, engine can be started.	Preglow indicator lamp. Open or short circuit in wiring.	24 ⇒ 1.0
Preglow indicator lamp lights constantly.	Preglow time-limit relay module (N14) binding.	N14
Preglow indicator lamp does not light, engine can not be started.	Preglow time-limit relay module (N14). Voltage supply to preglow time-limit relay module (N14) is missing.	24 ⇒ 2.0 + 3.0
Preglow indicator lamp does not light with glow/starter switch ON or lights for approx. 1 minute while driving. Engine is hard to start.	Open circuit in one or several glow plugs or wires to glow plugs. Current draw of glow plugs not in order. Preglow indicator lamp	24 ⇒ 3.0
Preglow time until preglow indicator lamp goes out is too short or too long	ECT sensor (B11/8). Wires to ECT sensor (B11/8).	24 ⇒ 4.0

1) Observe Preparation for Test, see 22.

Note regarding preglow circuit:

An electronic short circuit protection feature is installed in the preglow time-limit relay module. If a short circuit occurs in the glow plugs or the wires to the glow plugs, the current is interrupted.

The preglow time-limit relay module is again operational if the short circuit is eliminated and the glow/starter switch is turned to position "0".

A malfunction of a glow plug is **not** indicated by the preglow indicator lamp.

Diagnosis – Table of Trouble Code Description

≥ 1		Pressure sensor B28
	System trouble code OBD trouble code	P0105 P0105
	Storage of DTC and activation of CHECK ENGINE MIL	Immediately after occurrence of fault
	Monitoring time and frequency of test	Continuously
	Checked signal or condition	The intake manifold absolute pressure is registered by the pressure sensor (B28) and transmitted to the IFI control module.
	Supply voltage Supply voltage Signal voltage Signal voltage Engine rpm	The IFI control module checks the voltage values: < 4.7 V longer than 2 seconds > 5.0 V longer than 2 seconds > 4.6 V longer than 2 seconds < 0.4 V longer than 2 seconds < 800 rpm and the difference between Intake manifold pressure – atmospheric pressure > 210 mbar longer than 6 seconds
	Test step/Remedy	23 ⇒ 6.0

Diagnosis – Table of Trouble Code Description

≥ 2		IAT sensor B17
	System trouble code OBD trouble code	P0110 P0111
	Storage of DTC and activation of CHECK ENGINE MIL	Two consecutive trips with fault
	Monitoring time and frequency of test	Continuously
	Checked signal or condition	The IFI control module checks the voltage present at the IAT sensor for the threshold values. If the threshold is exceeded, the IFI control module replaces it with a substitute value.
	Signal voltage Signal voltage	The IFI control module checks the voltage values: > 4.7 V longer than 2 seconds < 0.2 V longer than 2 seconds
	Test step/Remedy	23 ⇒ 5.0

Diagnosis – Table of Trouble Code Description

≥ 3		ECT sensor B11/4
	System trouble code OBD trouble code	P0115 P0115
	Storage of DTC and activation of CHECK ENGINE MIL	Two consecutive trips with fault
	Monitoring time and frequency of test	Continuously
	Checked signal or condition	The IFI control module checks after starting the engine when engine rpm is once > 1000 rpm and the coolant temperature is not > 35°C after 20 minutes, the ECT sensor is recognized as faulty. The IFI control module checks the voltage present at the ECT sensor for the threshold values. If the threshold is exceeded, the IFI control module replaces it with a substitute value.
	Signal voltage Signal voltage	The IFI control module checks the voltage values: < 0.2 V longer than 500 ms >4.7 V longer than 500 ms As of an engine speed > 1000 rpm the coolant temperature must be > 35°C after at least 20 minutes.
	Test step/Remedy	23 ⇒ 4.0

Diagnosis – Table of Trouble Code Description

≥ 4		Fuel temperature sensor Y1/1b1
	System trouble code OBD trouble code	P0180 P0181
	Storage of DTC and activation of CHECK ENGINE MIL	Two consecutive trips with fault
	Monitoring time and frequency of test	Continuously
	Checked signal or condition	The IFI control module checks the voltage present at the fuel temperature sensor for the threshold values. If the threshold is exceeded, the IFI control module replaces it with a substitute value.
	Signal voltage Signal voltage	The IFI control module checks the voltage values: < 0.2 V longer than 2 seconds > 4.7 V longer than 2 seconds
	Test step/Remedy	23 ⇒ 23.0

Diagnosis – Table of Trouble Code Description

≥ 5		EGR, vacuum control, intake manifold pressure
	System trouble code OBD trouble code	P0400 P0400
	Storage of DTC and activation of CHECK ENGINE MIL	Immediately after occurrence of fault
	Monitoring time and frequency of test	Continuously
	Checked signal or condition	The logic chain EGR is checked, if the following conditions are met simultaneously: <ul style="list-style-type: none"> • Engine rpm approx. 1900 – 2600 rpm and constant • Engine coolant temperature > 60 °C A negative control deviation is present, if the control module calculates a lift of nominal = 2 mm but the EGR lifting sender (B28/3) reports a lift of actual = 4 mm to the IFI control module (N3/7). Control deviation 2 mm.
	Signal voltage Signal voltage Control deviation positive Control deviation negative	The IFI control module checks the electrical connection and permanent control deviation: <ul style="list-style-type: none"> > 5.2 V longer than 2 seconds 0 V longer than 2 seconds > 2.5 mm longer than 4 seconds < 1.5 mm longer than 4 seconds
	Test step/Remedy	23 ⇒ 31.0

Diagnosis – Table of Trouble Code Description

≥ 6		Atmospheric pressure sensor in control module
	System trouble code OBD trouble code	P1105 P0106
	Storage of DTC and activation of CHECK ENGINE MIL	Immediately after occurrence of fault
	Monitoring time and frequency of test	Continuously
	Checked signal or condition	
	Signal voltage Signal voltage	The IFI control module checks the voltage values: > 4.7 V longer than 2 seconds < 2.2 V longer than 2 seconds
	Test step/Remedy	N3/7

Diagnosis – Table of Trouble Code Description

≥ 7		Fuel quantity actuator Y23/1
	System trouble code OBD trouble code	P1220 P0200
	Storage of DTC and activation of CHECK ENGINE MIL	Immediately after occurrence of fault
	Monitoring time and frequency of test	Continuously
	Checked signal or condition	Control deviation between fuel rack position sensor and fuel quantity actuator see nominal – actual value comparison
		The IFI control module checks the voltage values
	Test step/Remedy	23 ⇒ 8.0

Diagnosis – Table of Trouble Code Description

≥ 8		IFI accelerator pedal position sensor R25/2
	System trouble code OBD trouble code	P1222 P0220
	Storage of DTC and activation of CHECK ENGINE MIL	Immediately after occurrence of fault
	Monitoring time and frequency of test	Continuously
	Checked signal or condition	Checking the supply voltage. If the accelerator pedal position sensor is activated > 20%, the idle speed contact display must be OFF, see HHT actual values. As of < 1% the idle speed contact in the accelerator pedal position sensor must be actuated. If the accelerator pedal position sensor is not actuated, the display on the HHT must be 0%, see HHT actual values.
	Supply voltage Supply voltage Signal voltage	The IFI control module checks the voltage values: > 5 V longer than 2 seconds < 4.7 V longer than 2 seconds > 4.7 V longer than 240 ms
	Test step/Remedy	23 ⇒ 10.0

Diagnosis – Table of Trouble Code Description

≥ 9		Fuel rack position sensor Y23/111
	System trouble code OBD trouble code	P1223 P0200
	Storage of DTC and activation of CHECK ENGINE MIL	Immediately after occurrence of fault
	Monitoring time and frequency of test	Continuously
	Checked signal or condition	Control deviations between fuel rack position sensor and fuel quantity actuator see nominal – actual value comparison
	Signal voltage Signal voltage	The IFI control module checks the signal voltage: > 4.8 V longer than 320 ms < 0.35 V longer than 120 ms
	Test step/Remedy	23 ⇒ 9.0

Diagnosis – Table of Trouble Code Description

≥ 10		CKP sensor L5/6
	System trouble code OBD trouble code	P1335 P0725
	Storage of DTC and activation of CHECK ENGINE MIL	Immediately after occurrence of fault
	Monitoring time and frequency of test	Continuously
	Checked signal or condition	Checking for dynamic plausibility, e.g. the time from one impulse to the next must not deviate by a specified time
		Engine is shut off
	Test step/Remedy	23 ⇒ 7.0

Diagnosis – Table of Trouble Code Description

≥ 11		EGR lifting sender B28/3
	System trouble code OBD trouble code	P1401 P0403
	Storage of DTC and activation of CHECK ENGINE MIL	Immediately after occurrence of fault
	Monitoring time and frequency of test	Continuously
	Checked signal or condition	Monitoring of supply and signal voltage
	Signal voltage Supply voltage Supply voltage Signal voltage, ignition ON	The IFI control module checks the voltage values: > 4.7 V longer than 2 seconds > 5 V longer than 2 seconds <4.7 V longer than 2 seconds >1.3 V longer than 2 seconds
	Test step/Remedy	23 ⇒ 30.0

Diagnosis – Table of Trouble Code Description

≥ 12		Pressure control flap vacuum transducer Y31/2
	System trouble code OBD trouble code	P1470 P0120
	Storage of DTC and activation of CHECK ENGINE MIL	Immediately after occurrence of fault
	Monitoring time and frequency of test	Continuously
	Checked signal or condition	The IFI control module (N3/7) checks the electrical wiring and for permanent control deviations. Monitoring for positive or negative control deviations. Monitoring the final stage for short and open circuit.
	Engine coolant temperature Positive control deviation Negative control deviation	> 60 °C, Engine speed approx. 2500 rpm, control deviation > 6 seconds > 210 mbar longer than 6 seconds > 75 mbar longer than 6 seconds
	Test step/Remedy	23 ⇒ 32.0

Diagnosis – Table of Trouble Code Description

➤ 13		Resonance intake line switchover valve Y22/7
	System trouble code OBD trouble code	P1475 P0200
	Storage of DTC and activation of CHECK ENGINE MIL	Immediately after occurrence of fault
	Monitoring time and frequency of test	Continuously
	Checked signal or condition	The IFI control module checks the activation. If problems occur longer than approx. 2 seconds, the control module recognizes a fault. Monitoring the final stage for short and open circuit.
	Test step/Remedy	23 ⇒ 26.0


Diagnosis – Table of Trouble Code Description

≥ 14		Resonance intake manifold switchover valve Y22/6
	System trouble code OBD trouble code	P1476 P0200
	Storage of DTC and activation of CHECK ENGINE MIL	Immediately after occurrence of fault
	Monitoring time and frequency of test	Continuously
	Checked signal or condition	The IFI control module checks the activation. If problems occur longer than approx. 2 seconds, the control module recognizes a fault. Monitoring the final stage for short and open circuit.
	Test step/Remedy	23 ⇒ 27.0

Diagnosis – Table of Trouble Code Description

≥ 15		Preglow system
	System trouble code OBD trouble code	P1480 P0380
	Storage of DTC and activation of CHECK ENGINE MIL	Immediately after occurrence of fault
	Monitoring time and frequency of test	Continuously
	Checked signal or condition	The IFI control module checks if at engine speeds > 500 rpm the preglow indicator lamp goes out.
	Ignition: ON	The preglow indicator lamp must light up and go out after maximum preglow time or engine speed > 500 rpm. Preglow indicator lamp must go out while cranking engine.
	Test step/Remedy	24 ⇒ 1.0-4.0


Diagnosis – Table of Trouble Code Description

≥ 16		IFI control module N3/7
	System trouble code OBD trouble code	P1611 P0200
	Storage of DTC and activation of CHECK ENGINE MIL	Immediately after occurrence of fault
	Monitoring time and frequency of test	Continuously
	Checked signal or condition	Internal check of control module for over/under voltage.
		 Control module fault, replace control module.
	Test step/Remedy	N3/7


Diagnosis – Table of Trouble Code Description

≥ 17		IFI control module circuit 15
	System trouble code OBD trouble code	P1612 P1612
	Storage of DTC and activation of CHECK ENGINE MIL	Immediately after occurrence of fault
	Monitoring time and frequency of test	Continuously
	Checked signal or condition	If no voltage supply via circuit 15 is supplied to the control module with ignition ON , a fault is present.
	Supply voltage	11 – 14 V
	Test step/Remedy	23 ⇒ 2.0

Diagnosis – Table of Trouble Code Description

≥ 18		IFI control module
	System trouble code OBD trouble code	P1613 P0200
	Storage of DTC and activation of CHECK ENGINE MIL	Immediately after occurrence of fault
	Monitoring time and frequency of test	Continuously
	Checked signal or condition	Internal check in control module after engine is turned off
		 Control module fault, replace control module.
	Test step/Remedy	N3/7


Diagnosis – Table of Trouble Code Description

≥ 19		IFI control module, fuel metering actuator or fuel rack position sensor
	System trouble code OBD trouble code	P1614 P0200
	Storage of DTC and activation of CHECK ENGINE MIL	Immediately after occurrence of fault
	Monitoring time and frequency of test	Continuously
	Checked signal or condition	Internal check of the control module during operation and after engine is turned off.
		 Control module fault, replace control module.
	Test step/Remedy	23 ⇒ 8.0 + 9.0

Diagnosis – Table of Trouble Code Description

➤ 20		IFI control module supply voltage
	System trouble code OBD trouble code	P1615 P0560
	Storage of DTC and activation of CHECK ENGINE MIL	Immediately after occurrence of fault
	Monitoring time and frequency of test	Continuously
	Checked signal or condition	Supply voltage is checked for over/under voltage
	Supply voltage Battery voltage Battery voltage	11 – 14 V > 17.5 V longer than 5 seconds < 8 V longer than 5 seconds
	Test step/Remedy	23 ⇒ 1.0

Diagnosis – Table of Trouble Code Description

≥ 21		IFI control module or not correctly coded
	System trouble code OBD trouble code	P1617 P0200
	Storage of DTC and activation of CHECK ENGINE MIL	Immediately after occurrence of fault
	Monitoring time and frequency of test	Continuously
	Checked signal or condition	With ignition ON and after engine is turned off.
		 check version coding, correct
	Test step/Remedy	see HHT “version coding“ menu point 5

Diagnosis – Table of Trouble Code Description

➤ 22		IFI electrohydraulic shut-off actuator Y1/1
	System trouble code OBD trouble code	P1622 P0200
	Storage of DTC and activation of CHECK ENGINE MIL	Immediately after occurrence of fault
	Monitoring time and frequency of test	Continuously
	Checked signal or condition	Checking of final stage and test when turning off engine
		i The engine speed must drop within 2 seconds < 500 rpm after turning off engine. Short circuit of electrohydraulic actuator against battery +
	Test step/Remedy	23 ⇒ 22.0

Electrical Test Program – Component Locations

Engine 606.912
Electrical Components in Engine
Compartment

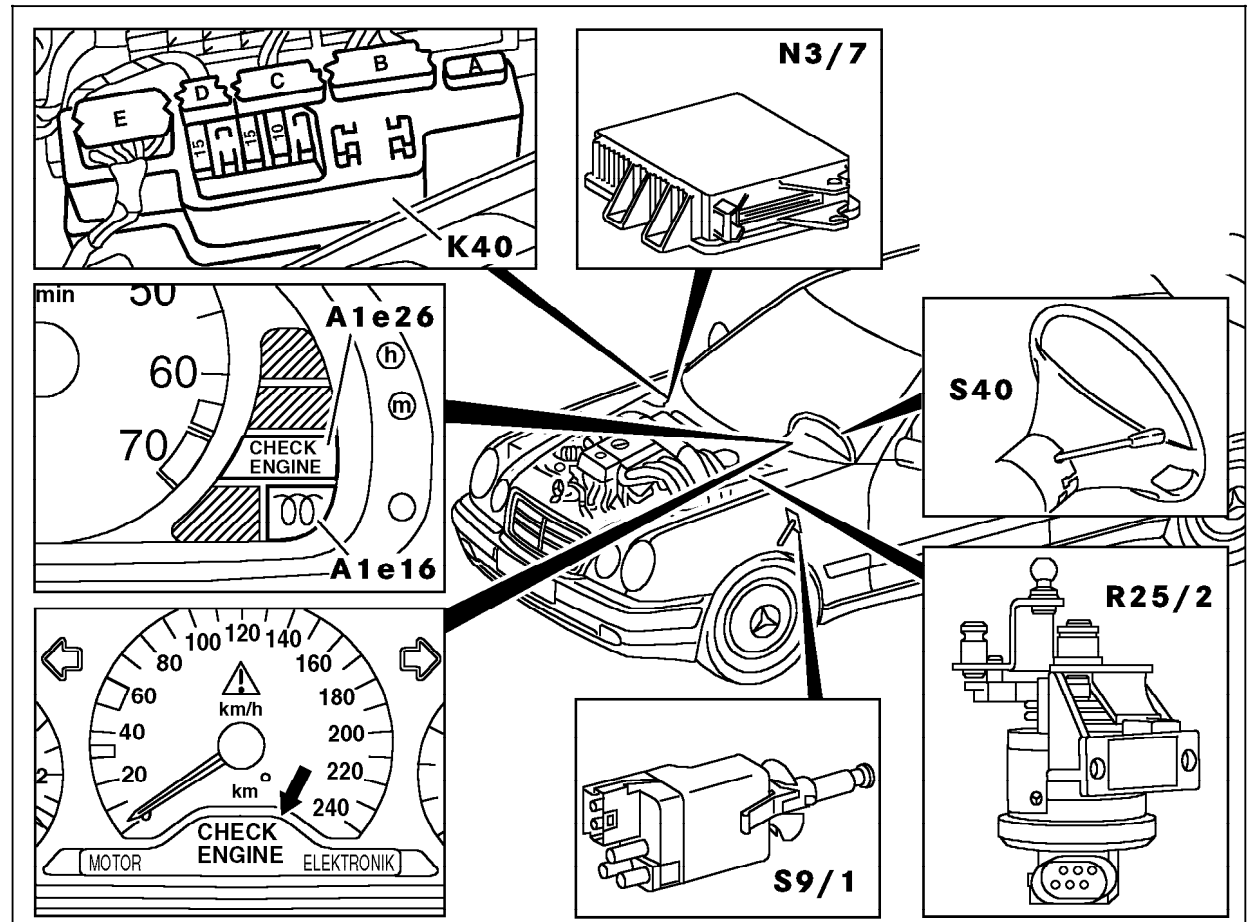


Figure 1

- A1e16 Preglow indicator lamp
- A1e26 CHECK ENGINE MIL
- K40 Relay module (IFI, base function)
- N3/7 Engine control module (IFI)
- R25/2 IFI accelerator pedal position sensor
- S9/1 Stop lamp switch (4-pole)
- S40 CC switch

U07.12-0253-57

Electrical Test Program – Component Locations

Engine 606.912
Electrical Components in Engine
Compartment

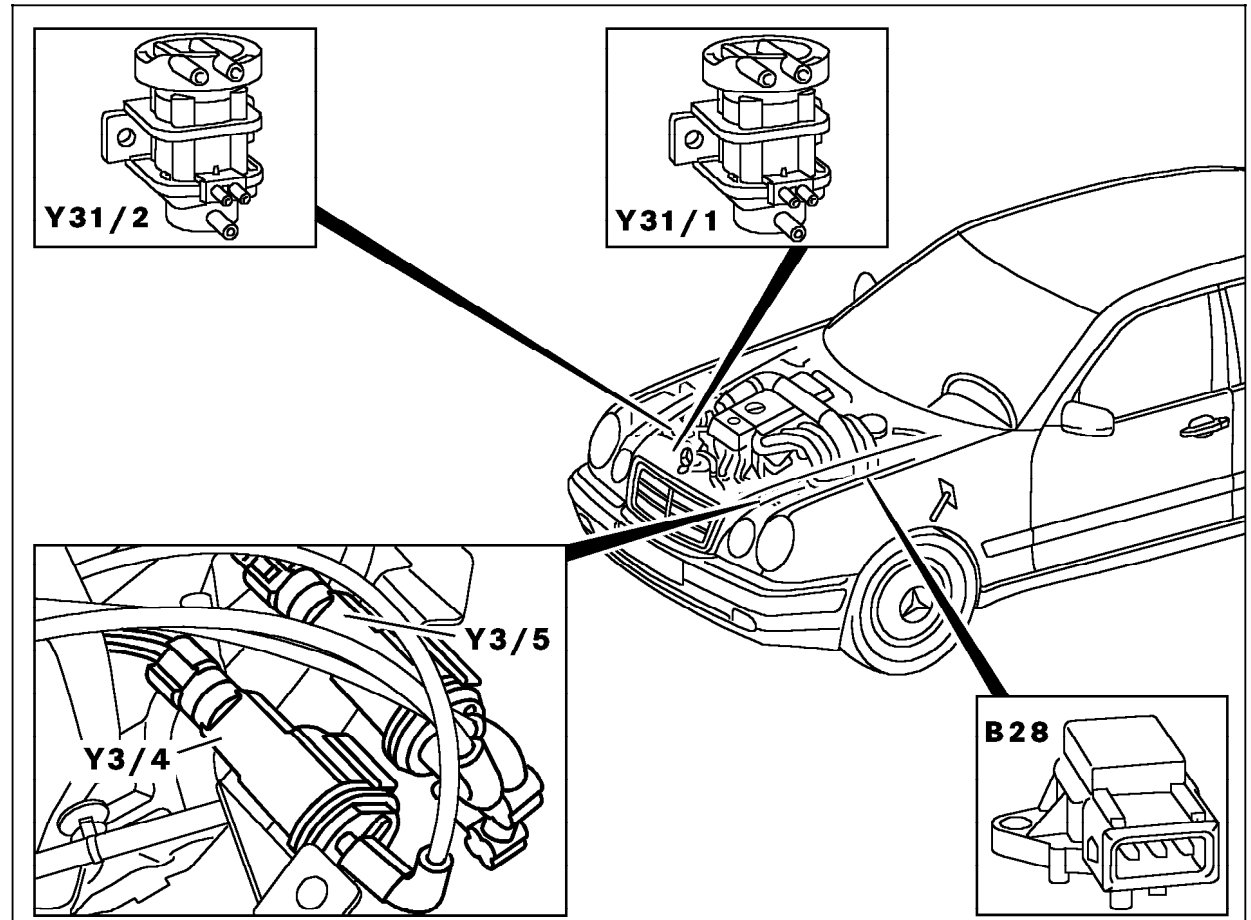


Figure 2

- | | |
|-------|---|
| B28 | Pressure sensor |
| Y3/4 | Modulator pressure switchover valve (AT/CC) |
| Y3/5 | Upshift delay switchover valve (AT/CC) |
| Y31/1 | EGR valve vacuum transducer |
| Y31/2 | Pressure control flap vacuum transducer |

U07.12-0252-57

Electrical Test Program – Component Locations

Electrical Components on Engine

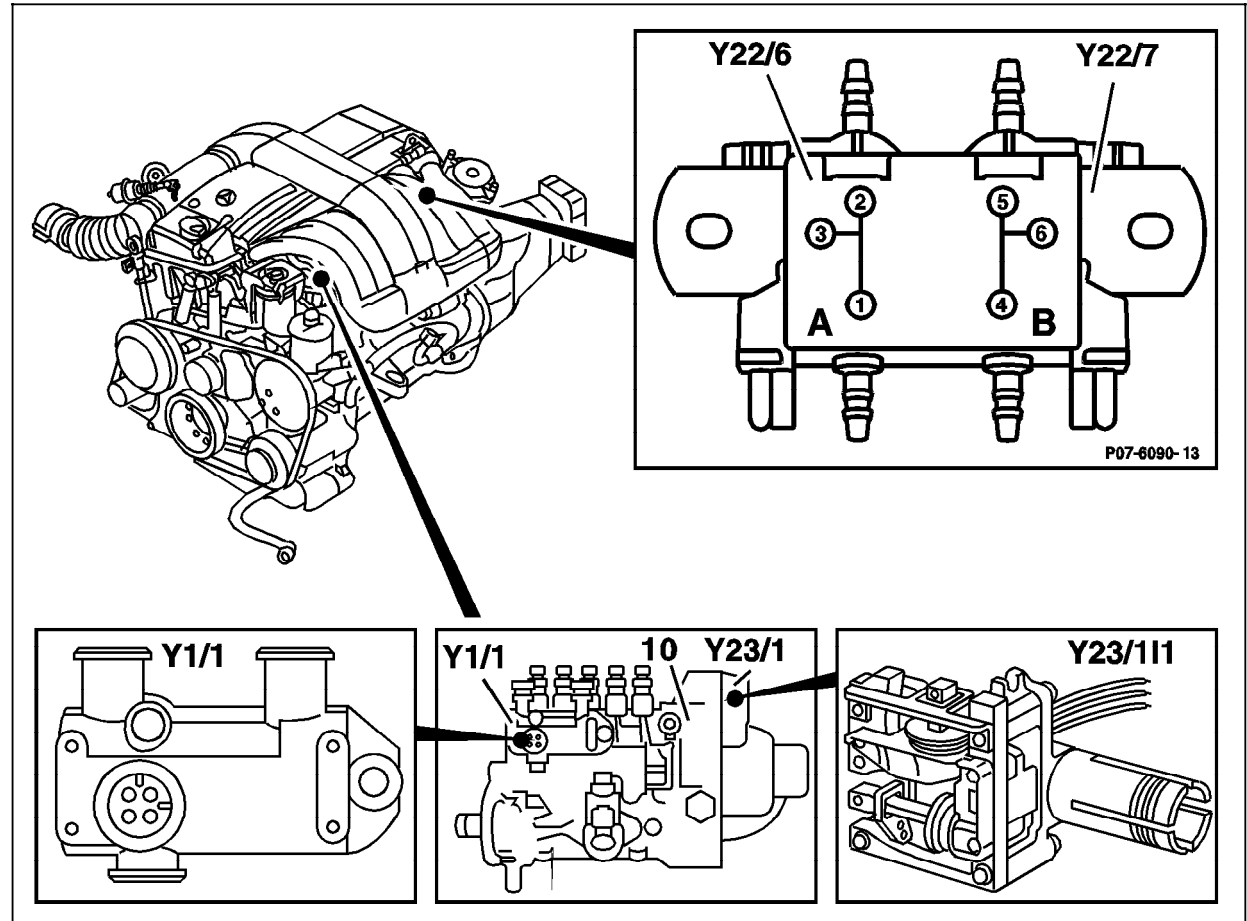


Figure 3

- 10 In-line fuel injection pump
- Y1/1 IFI electrohydraulic shut-off actuator
- Y22/6 Resonance intake manifold switchover valve
- Y22/7 Resonance intake line switchover valve
- Y23/1 Fuel quantity actuator (IFI)
- Y23/111 Fuel rack position sensor

P07.12-0267-57

Electrical Test Program – Component Locations

Electrical Components on Engine

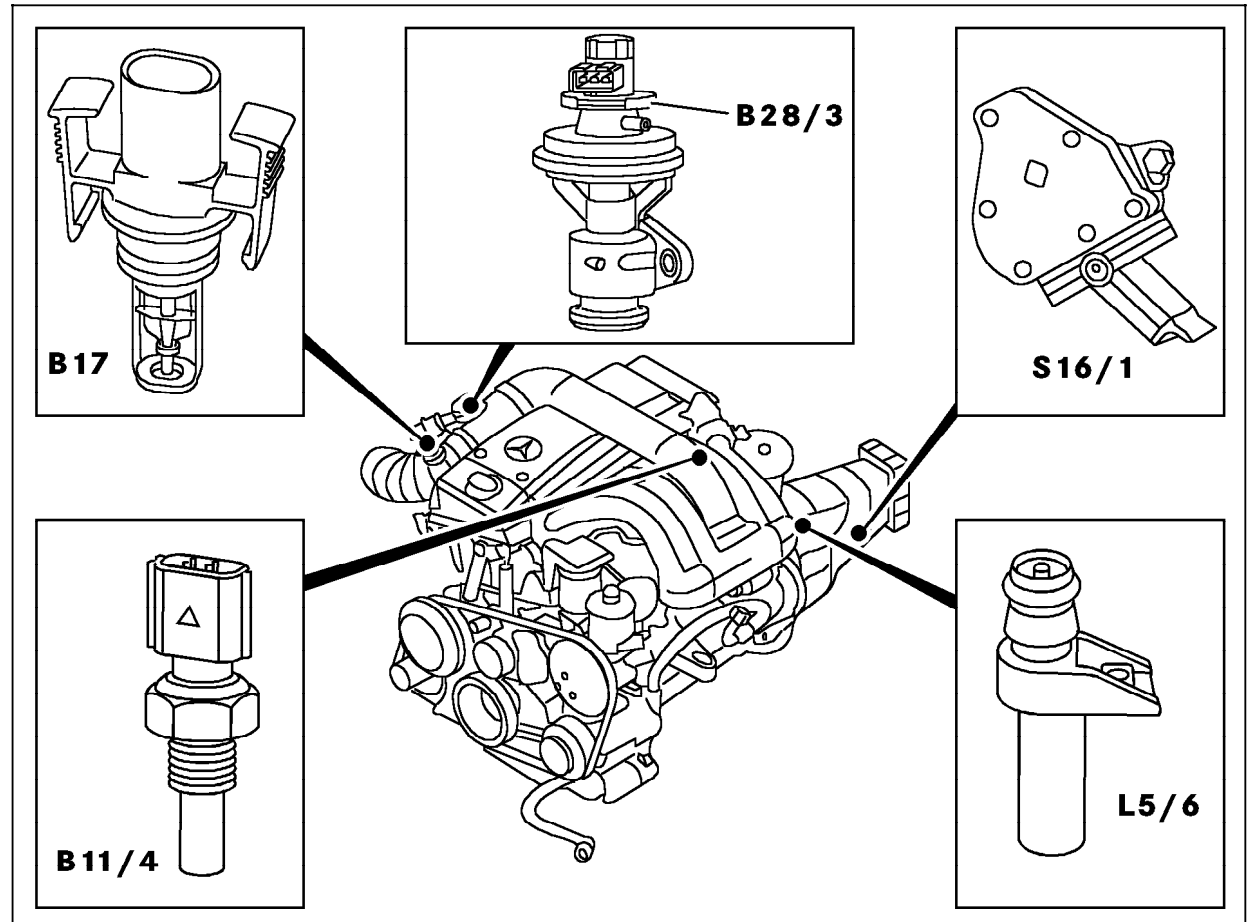


Figure 4

- B11/4 ECT sensor (IFI)
- B17 IAT sensor
- B28/3 EGR lifting sender
- L5/6 CKP sensor (IFI)
- S16/1 Starter lock-out/backup lamp switch

P07.12-0268-57

Electrical Test Program – Component Locations

Engine 606.912
 Preglow System Components

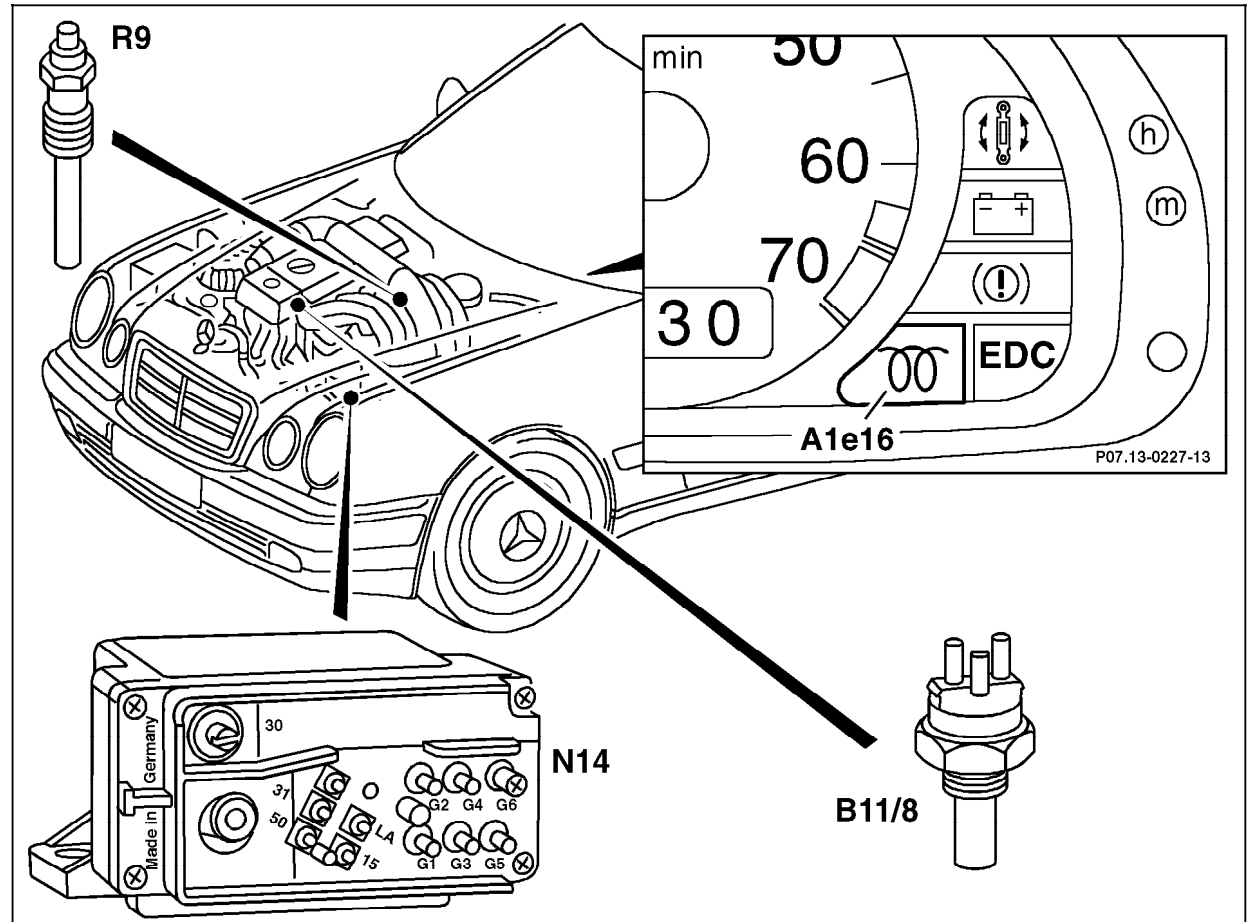


Figure 5
 A1e16 Preglow indicator lamp
 B11/8 ECT sensor (preglow system)
 N14 Preglow time-limit relay module
 R9 Glow plugs

Electrical Test Program - Preparation for Test

Preliminary work:

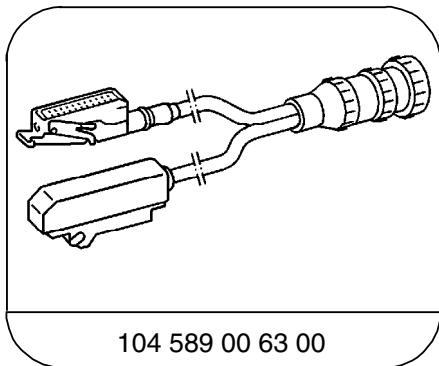
Diagnosis - Diagnostic Trouble Code (DTC) Memory 11

1. Ignition: **OFF**
2. Fuse on relay module (K40) in order.
Relay module in order.
Relay module plug connected.
3. Disconnect IFI control module (N3/7) connector.
4. Connect socket box with test cable to IFI control module (N3/7).

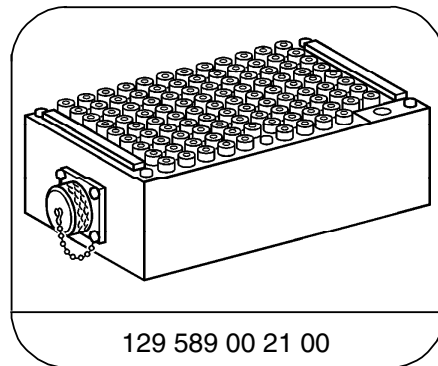
Electrical wiring diagrams :

Electrical Troubleshooting Manual, Model 210, Volume 1

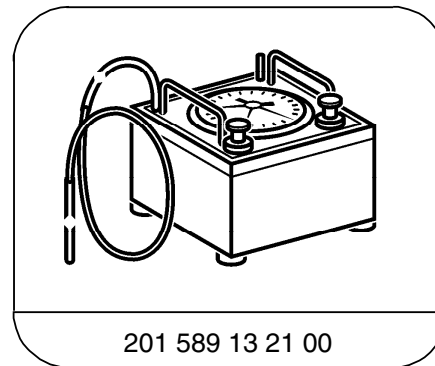
Special Tools



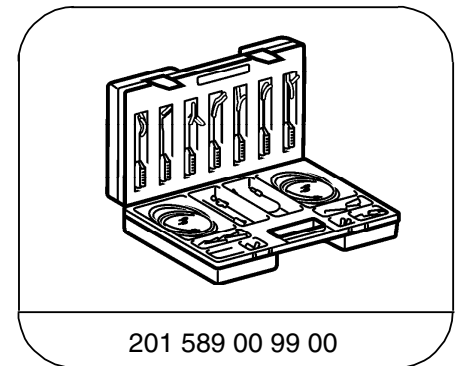
Test cable



126-pin socket box



Tester



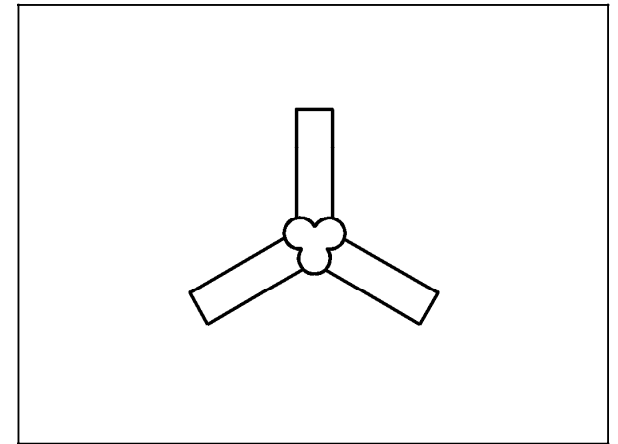
Electrical connecting set

Electrical Test Program - Preparation for Test

Conventional tools, test equipment

Description	Brand, model, etc.
Multimeter ¹⁾	Fluke models 23, 83, 85, 87
Engine analyzer ¹⁾	Bear DACE
Y - fitting	117 078 01 45

¹⁾ Available through the MBUSA Standard Equipment Program.



P07.12-0438-01

Figure 1

Y - fitting

Electrical Test Program – Preparation for Test

Connection Diagram – Socket box

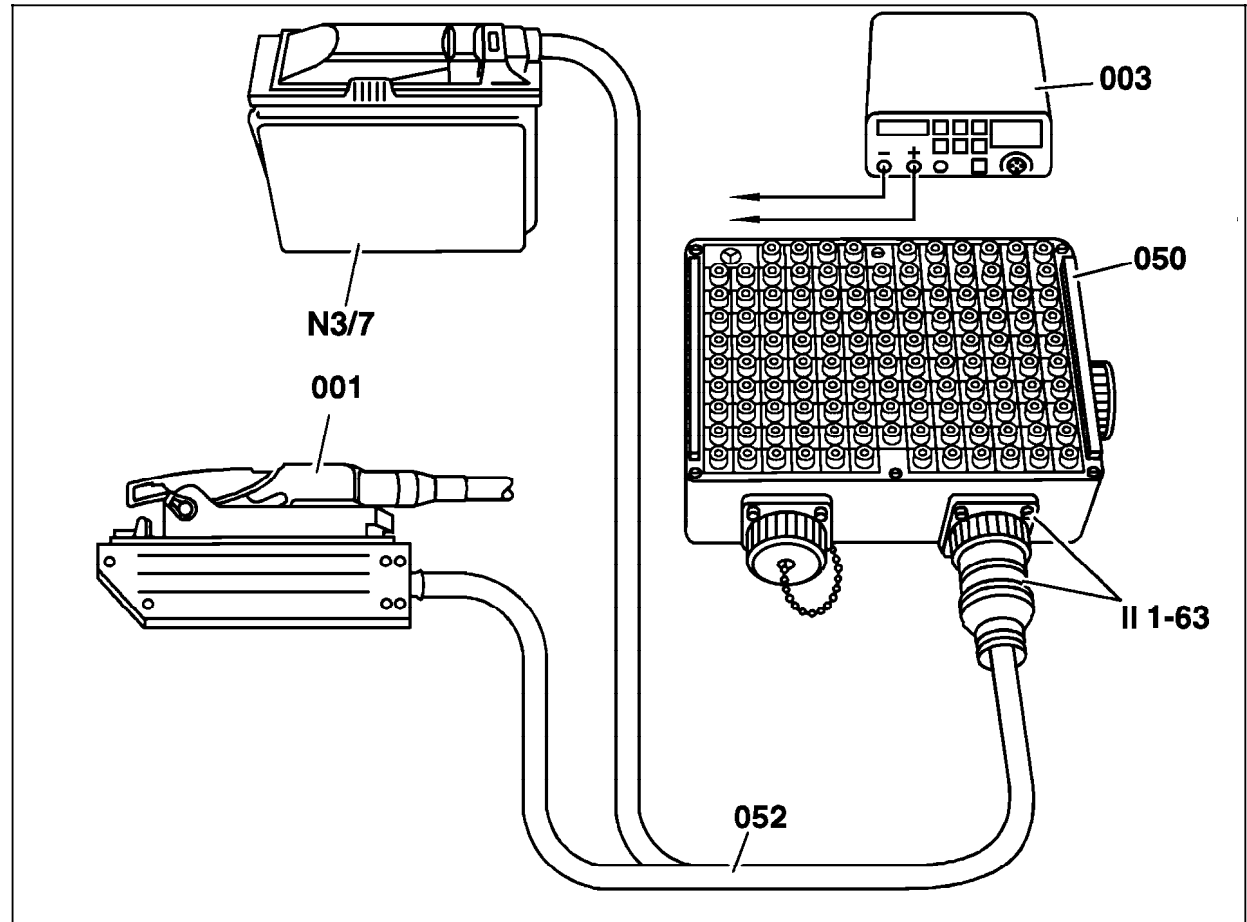


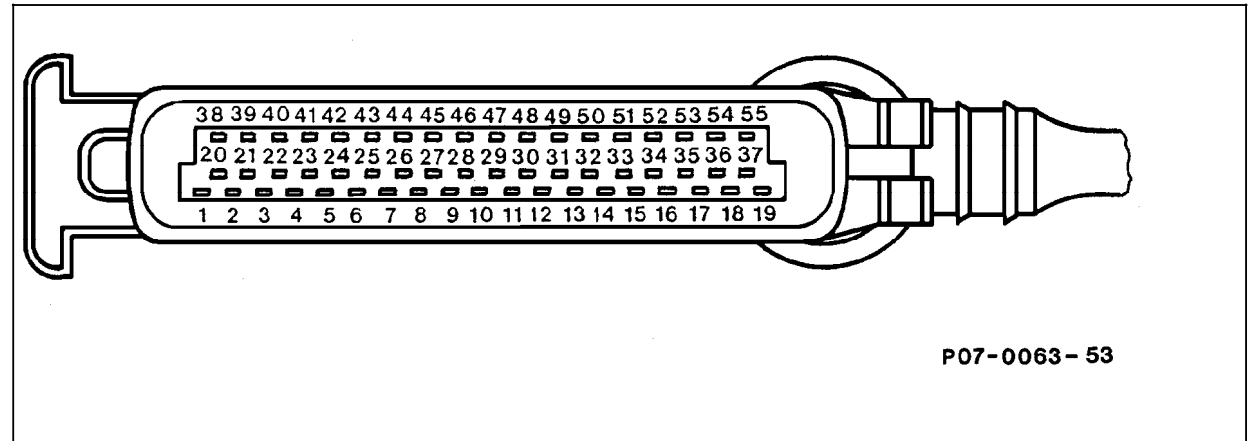
Figure 2

- 001 IFI control module connector
- 003 Multimeter
- 050 Socket box (126-pole)
- 052 Test cable
- N3/7 IFI control module

P07-6137-57

Electrical Test Program – Preparation for Test

Connector Layout - IFI Control Module (N3/7)



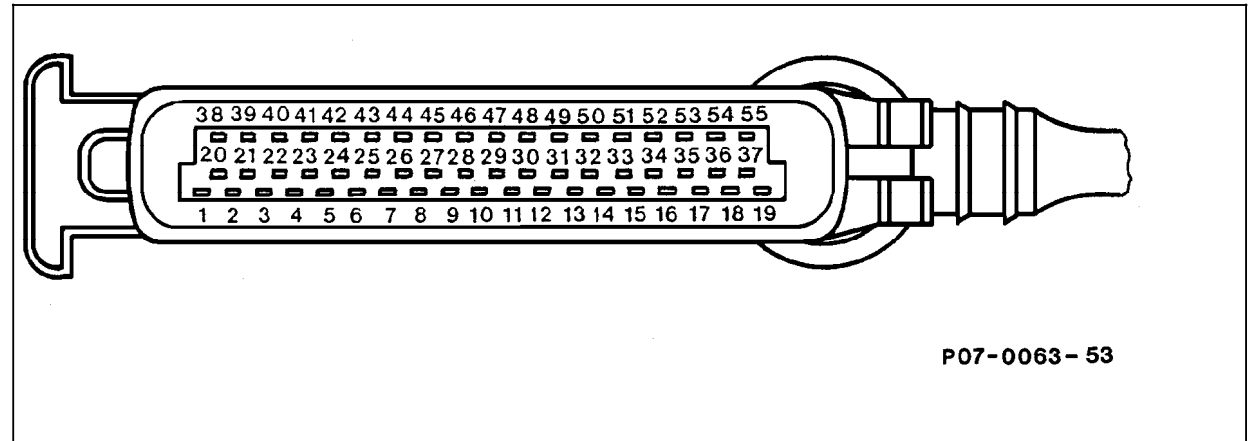
P07-0063-53

Figure 3

1	–	16	–
2	–	17	CHECK ENGINE MIL
3	Fuel temperature sensor in electrohydraulic shut off actuator, socket 4	18	Ground W16/5 – W16/6 (electronics)
4	Sensor ground GND	19	Ground W16/5 – W16/6 (electronics)
5	CAN data bus (socket L)	20	CKP sensor (socket 1)
6	IFI accelerator pedal position sensor (potentiometer ,socket 6)	21	EGR lifting sender (B28/3)
7	Signal from ETS control module	22	Pressure sensor (socket 1)
8	CC switch (accelerate/set, socket 4)	23	ECT sensor (socket 1)
9	Fuel rack position sensor (socket 7)	24	IFI accelerator pedal position sensor (CTP switch, socket 3)
10	Fuel rack position sensor (socket 1)	25	VSS from ABS control module
11	Resonance intake manifold switchover valve	26	Terminal HRL from relay module K40 (connector E, socket 3)
12	Starter lock-out/backup lamp switch	27	Stop lamp switch (connector 1, socket 2)
13	–	28	Sensor ground
14	TN-signal	29	IFI accelerator pedal position sensor (potentiometer socket 1)
15	IFI accelerator pedal position sensor (CTP switch, socket 4)	30	CC switch (control contact, socket 6)

Electrical Test Program – Preparation for Test

Connector Layout - IFI Control Module (N3/7)



P07-0063-53







Figure 4

31	Stop lamp switch (connector 2, socket 2)	47	Circuit 15E
32	–	48	–
33	A/C compressor shut-off signal (N22, socket 10)	49	Modulating pressure switchover valve (AT/CC) (socket 1)
34	Upshift delay switchover valve (socket 1)	50	Diagnostic signal (to X11/4, socket 4)
35	EGR valve vacuum transducer (Y31/1)	51	Resonance intake line switchover valve (socket 1)
36	Fuel quantity actuator (socket 2)	52	–
37	Voltage supply, circuit 87U, unfused (relay module K40, connector E, socket 7)	53	Pressure control flap vacuum transducer (socket 1)
38	CC switch (decelerate/set, socket 3)	54	Fuel quantity actuator (IFI) (socket 2)
39	IFI accelerator pedal position sensor (potentiometer, socket 5)	55	Voltage supply, circuit 87U, unfused (relay module K40, connector E, socket 7)
40	IAT sensor (socket 2)		
41	CAN data bus (socket H)		
42	CC switch (resume, socket 5)		
43	IFI electrohydraulic shut-off actuator (socket 3)		
44	CC switch (off, socket 1)		
45	Pressure sensor (socket 3)		
46	Fuel rack position sensor (IFI) (socket 6)		

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
1.0	P1615	IFI control module (N3/7) Voltage supply Circuit 87 unfused		Ignition: ON	11 – 14 V	Relay module (K40) (Figure 1), Wiring, ⇒ 1.1
1.1		Ground, component compartment – right (W16/6)		Ignition: OFF	11 – 14 V	Ground W16/6, ⇒ 1.2
1.2		Holding relay activation Terminal HRL		Ignition: ON or engine at CTP (idle) Engine: Shut off	11 – 14 V 11 – 14 V for approx. 4 sec. then < 1 V	Relay module (K40), IFI control module (N3/7), Wiring.
2.0	P1612	Circuit 15U		Ignition: ON	11 – 14 V	Check voltage supply, Wiring.

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy																				
3.0		Relay module (K40) Voltage supply Model 210 up to 02/67	Plug K40 Plug B B 5 —  — 4	Ignition: OFF Disconnect plug B	11 – 14 V	Check voltage supply, Wiring, Output ground, component compartment – right (W15/1), Relay module (K40),																				
4.0		ECT sensor (B11/4) Voltage	N3/7  4 —  — 23	Ignition: ON	<table border="0"> <tr> <td>°C</td> <td>V</td> </tr> <tr> <td>20</td> <td>3.7</td> </tr> <tr> <td>30</td> <td>3.4</td> </tr> <tr> <td>40</td> <td>3.0</td> </tr> <tr> <td>50</td> <td>2.6</td> </tr> <tr> <td>60</td> <td>2.1</td> </tr> <tr> <td>70</td> <td>1.8</td> </tr> <tr> <td>80</td> <td>1.5</td> </tr> <tr> <td>90</td> <td>1.2</td> </tr> <tr> <td></td> <td>± 10%</td> </tr> </table>	°C	V	20	3.7	30	3.4	40	3.0	50	2.6	60	2.1	70	1.8	80	1.5	90	1.2		± 10%	B11/4 (Figure 2), Wiring, IFI control module (N3/7) ⇒ 4.1
°C	V																									
20	3.7																									
30	3.4																									
40	3.0																									
50	2.6																									
60	2.1																									
70	1.8																									
80	1.5																									
90	1.2																									
	± 10%																									

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy																				
4.1		Resistance		Ignition: OFF Disconnect plug on IFI control module (N3/7)	<table> <tr> <td>°C</td> <td>Ω</td> </tr> <tr> <td>20</td> <td>2500</td> </tr> <tr> <td>30</td> <td>1700</td> </tr> <tr> <td>40</td> <td>1170</td> </tr> <tr> <td>50</td> <td>830</td> </tr> <tr> <td>60</td> <td>600</td> </tr> <tr> <td>70</td> <td>435</td> </tr> <tr> <td>80</td> <td>325</td> </tr> <tr> <td>90</td> <td>245</td> </tr> <tr> <td></td> <td>± 10%</td> </tr> </table>	°C	Ω	20	2500	30	1700	40	1170	50	830	60	600	70	435	80	325	90	245		± 10%	B11/4 (Figure 2) Wiring, ⇒ 4.2
°C	Ω																									
20	2500																									
30	1700																									
40	1170																									
50	830																									
60	600																									
70	435																									
80	325																									
90	245																									
	± 10%																									
4.2		B11/4		Ignition: OFF Disconnect plug on ECT sensor (B11/4)	Nominal values see ⇒ 4.1	B11/4 (Figure 2).																				
5.0		IAT sensor (B17) Voltage		Engine: At CTP	<table> <tr> <td>°C</td> <td>V</td> </tr> <tr> <td>20</td> <td>3.3</td> </tr> <tr> <td>30</td> <td>2.9</td> </tr> <tr> <td>40</td> <td>2.5</td> </tr> <tr> <td></td> <td>±5%</td> </tr> </table>	°C	V	20	3.3	30	2.9	40	2.5		±5%	B17 (Figure 3), Wiring, IFI control module (N3/7), ⇒ 5.1										
°C	V																									
20	3.3																									
30	2.9																									
40	2.5																									
	±5%																									

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy										
5.1		Resistance		Ignition: OFF Remove plug on IFI control module (N3/7)	<table border="0"> <tr> <td>°C</td> <td>Ω</td> </tr> <tr> <td>20</td> <td>6060</td> </tr> <tr> <td>30</td> <td>3900</td> </tr> <tr> <td>40</td> <td>2600</td> </tr> <tr> <td></td> <td>±5%</td> </tr> </table>	°C	Ω	20	6060	30	3900	40	2600		±5%	B17 (Figure 3), Wiring, ⇒ 5.2
°C	Ω															
20	6060															
30	3900															
40	2600															
	±5%															
5.2		B17		Ignition: OFF Remove plug on sensor B17 (Figure 3)	Nominal values see ⇒ 5.1	B17.										
6.0	PQ105	Pressure sensor (B28) Note for connection: Connect pressure tester with Y-fitting to pressure sensor		Engine: At CTP Slowly increase engine speed to 2500 rpm	> 2.5 V Voltage: Drops Vacuum: Rises	⇒ 6.1 Pressure lines.										
6.1		B28		Ignition: ON	4.8 – 5.2 V	B28 (Figure 4), Wiring, IFI control module (N3/7).										


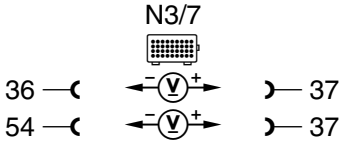
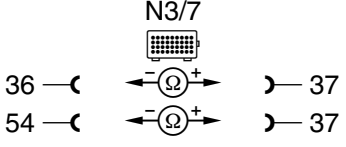
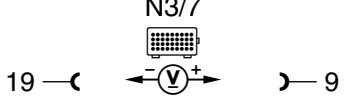
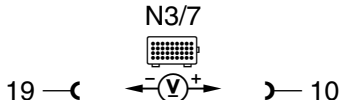
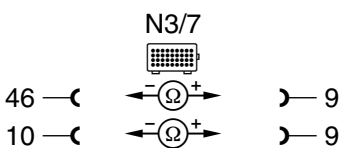
Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
7.0	P1335 P0725	CKP sensor (L5/6)	<p>N3/7 ²⁾</p> <p>28 —(← ⊕ →)— 20</p> <p>N3/7 ¹⁾</p> <p>28 —(← ⊕ →)— 20</p>	<p>Engine: At CTP</p> <p>Engine: At CTP</p> <p>Cranking rpm: > 200 rpm</p>	<p>Signal see Figure 5</p> <p>> 0.8 V increasing rpm = increasing voltage</p> <p>> 0.3 V</p>	<p>Installation position of sensor, Dirt on sensor (metal chips), Segments on flywheel, ⇒ 7.1</p>
7.1		Resistance of sensor L5/6	<p>N3/7</p> <p>28 —(← Ω →)— 20</p>	<p>Ignition: OFF</p>	<p>680 – 1300 Ω</p>	<p>Connector L5/6x1 (Figure 6), Wiring,</p>





1) Test with multimeter only if oscilloscope is not available.

2) Test with oscilloscope. This test can be performed at idle speed with the Bear DACE engine analyzer. Set time axis to 25 milliseconds.

Electrical Test Program – Test



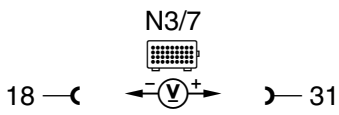
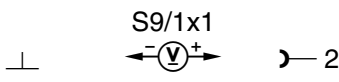
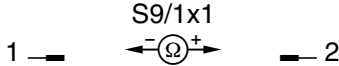
⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
8.0	P1220 P1614 P0200	Fuel quantity actuator (Y23/1) Adjustment solenoid		Ignition: ON	> 4.0 V max. for 30 seconds	⇒ 8.1
8.1		Resistance		Ignition: OFF Remove connector on IFI control module (N3/7)	1.2 Ω ± 0.2 1.2 Ω ± 0.2	Connector (Y23/1x1) (Figure 7), Y23/1, N3/7, Wiring.
9.0	P1223 P1614 P0200	Fuel rack position sensor (Y23/111)		Ignition: ON	2.2 – 2.7 V	Connector (Y23/1x1) (Figure 7), ⇒ 9.1
9.1				Ignition: ON	2.2 – 2.7 V	N3/7, Wiring, ⇒ 9.2
9.2		Resistance		Ignition: OFF Remove connector on IFI control module (N3/7)	23 Ω ±5% 45 Ω ±5%	Y23/1, Wiring.

Electrical Test Program – Test



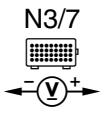
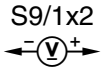
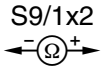
⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
10.0	P1222 P0220	IFI accelerator pedal position sensor (R25/2)	 6 — ◀ — ◀ — (V) — ▶ — ▶ — 29 6 — ◀ — ◀ — (V) — ▶ — ▶ — 39	Ignition: ON CTP position: Full load position:	> 4.5 V <0.5 V >4.3 V	R25/2 (Figure 8) Wiring, IFI control module (N3/7), W16/6, ⇒ 10.1
10.1		CTP contact switch (R25/2s1)	 18 — ◀ — ◀ — (V) — ▶ — ▶ — 15 15 — ◀ — ◀ — (V) — ▶ — ▶ — 24	Ignition: ON CTP position: Full load position: CTP position: Full load position:	> 4.5 V <0.5 V <0.5 V > 4.5 V	R25/2 (Figure 8) Wiring, IFI control module (N3/7), W16/6.
11.0	P1705	Starter lock-out/backup lamp switch (S16/1)	 18 — ◀ — ◀ — (V) — ▶ — ▶ — 12	Ignition: ON AT range: P/N → Engine: Start ⁴⁾ R →	0 V 11 – 14 V	S16/1, Wiring.

4) Engine does not start



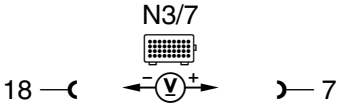

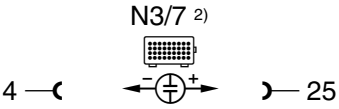

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
12.0		Stop lamp switch (S9/1) Signal (S9/1s1)		Ignition: ON Brake pedal: not depressed → depressed →	< 1 V 11 – 14 V	Wiring, Stop lamp switch (S9/1), (Figure 9), W16/6, ⇒ 12.1
12.1		Voltage supply Circuit 87E		Remove connector S9/1x1 Ignition: ON	11 – 14 V	Wiring, Voltage supply, ⇒ 12.2
12.2		Stop lamp switch (S9/1)		Ignition: OFF Remove connector S9/1x1 Brake pedal: not depressed → depressed →	> 20 kΩ < 1 Ω	Stop lamp switch (S9/1) (Figure 9).

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
13.0		Stop lamp switch (S9/1) Signal (S9/1s2)		Ignition: ON Brake pedal: not depressed → depressed →	 11 – 14 V < 1 V	Wiring, Stop lamp switch (S9/1) (Figure 9), ⇒ 13.1
13.1		Voltage supply Circuit 87E		Remove connector S9/1x2 Ignition: ON	 11 – 14 V	Wiring, Voltage supply, ⇒ 13.2
13.2		Stop lamp switch		Ignition: OFF Remove connector S9/1x2 Brake pedal: not depressed → depressed →	 < 1 Ω > 20 kΩ	Stop lamp switch (S9/1).



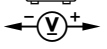

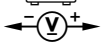

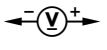

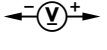

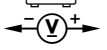
Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
14.0		ETS – slip recognition signal		Ignition: ON Engine: at CTP (idle)	< 1 V 11 – 14 V	ETS/SPS control module (N47-2), Wiring.
15.0		VSS from ABS control module (N30) or ETS/SPS control module (N47-2)	 	Ignition: ON Move vehicle approx. 3 ft. (1 m)	Signal see Figure 10 > 2.0 V	Check N30, N47-2 see DM, Chassis and Drivetrain, Volume 2, Section 6.3, Wiring.


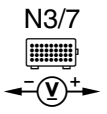
1) Test with multimeter only if oscilloscope is not available.

2) Test with oscilloscope. This test can be performed at idle speed with the Bear DACE engine analyzer. Set time axis to 25 milliseconds.

Electrical Test Program – Test


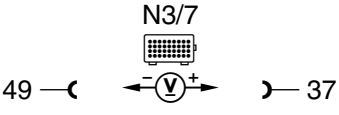

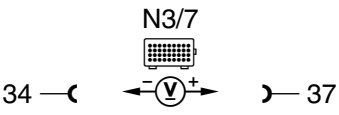

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy		
16.0	P1520	CC switch (S40)			Ignition: ON Switch S40s1 not actuated	< 1 V	Wiring, CC switch (S40).	
		SP Resume	18 —(		)— 42	Position: RESUME		11 – 14 V
		V Decelerate/set	18 —(		)— 38	S40s2 Position: DECELERATE		11 – 14 V
		B Accelerate/set	18 —(		)— 8	S40s3 Position: ACCELERATE		11 – 14 V
		A Off	18 —(		)— 44	Switch S40s4 not actuated Position: OFF		11 – 14 V < 1 V
		Safety contact	18 —(		)— 30	Switch S40s5not actuated Position: DECELERATE, ACCELERATE, RESUME, OFF	< 1 V 11 – 14 V	

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
17.0	P1625	CHECK ENGINE MIL (A1e26)		Ignition: ON Engine: Start	11 – 14 V Temporarily: 11 – 14 V, CHECK ENGINE MIL (A1e26) lights briefly for approx. 1 sec. ⁵⁾	CHECK ENGINE MIL (A1e26) (Figure 16 + 17), IFI control module (N3/7).
18.0		<i>Non-USA vehicles only.</i>				

⁵⁾ With malfunctions which prevent starting of engine or severely influence engine running, the voltage is continuously present or the CHECK ENGINE MIL lights continuously until the failure is eliminated.

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
19.0	P1780	Modulating pressure switchover valve (Y3/4) Voltage		Engine: At CTP ⁶⁾ CC in operation > 25 mph (40 km/h)	< 0.5 V >350 mbar 11 – 14 V < 35 mbar	IFI control module (N3/7), Vacuum lines, Vacuum supply, Wiring, Vacuum control valve, Throttle linkage, ⇒ 19.1
19.1		Current draw		Ignition: ON	0.40 A	Switchover valve (Y3/4) (Figure 12).
20.0		Non-USA vehicles only.				
21.0	P1781	Upshift delay switchover valve (Y3/5)		Engine: At CTP ⁶⁾ CC in operation > 25 mph (40 km/h)	< 0.5 V < 35 mbar 11 – 14 V > 350 mbar	IFI control module (N3/7), Vacuum lines, Vacuum supply, Wiring, ⇒ 21.1
21.1		Current draw		Ignition: ON	0.40 A	Upshift delay switchover valve (Y3/5) (Figure 12).

⁶⁾ Briefly apply WOT, vacuum and voltage decrease. The test values are reference values.

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
22.0	P1622 P0200	Electrohydraulic shut-off actuator (Y1/1) Activation	N3/7 18 —(—(←(V)→ —(— 43	Engine: At CTP	11 – 14 V	IFI control module (N3/7), Wiring, ⇒ 22.1
22.1		Current draw	N3/7 43 —(←(A)→ —(— X12/3	Ignition: OFF Control module removed	1.4 A ⁴⁾	⇒ 22.2
22.2		Resistance	Y1/1 2 —(←(Ω)→ —(— 3	Ignition: OFF Remove plug from IFI control module (N3/7)	8.1 ± 0.5 Ω	Y1/1

4) Electrohydraulic shut-off actuator clicks audibly.


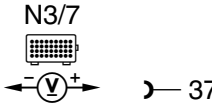

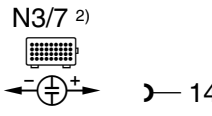
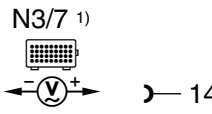
Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy										
23.0		Fuel temperature sensor (Y1/1b1)		Engine: At CTP	<table border="1"> <tr> <th>°C</th> <th>V</th> </tr> <tr> <td>20</td> <td>3.9</td> </tr> <tr> <td>30</td> <td>3.5</td> </tr> <tr> <td>40</td> <td>3.0</td> </tr> <tr> <td>50</td> <td>2.6</td> </tr> </table>	°C	V	20	3.9	30	3.5	40	3.0	50	2.6	⇒ 23.1
°C	V															
20	3.9															
30	3.5															
40	3.0															
50	2.6															
23.1		Resistance		Ignition: OFF Remove connector on IFI control module (N3/7)	<table border="1"> <tr> <th>°C</th> <th>Ω</th> </tr> <tr> <td>20</td> <td>2500</td> </tr> <tr> <td>30</td> <td>1700</td> </tr> <tr> <td>40</td> <td>1170</td> </tr> <tr> <td>50</td> <td>830</td> </tr> </table>	°C	Ω	20	2500	30	1700	40	1170	50	830	⇒ 23.2
°C	Ω															
20	2500															
30	1700															
40	1170															
50	830															
23.2		Y1/1b1		Ignition: OFF Remove connector on electrohydraulic shut-off actuator (Y1/1) (Figure 14)	Nominal values see ⇒ 23.1	Electrohydraulic shut-off actuator (Y1/1).										
24.0		IFI control module (N3/7) Signal from automatic A/C		Engine: At CTP Engine: Briefly apply WOT	11 – 14 V < 1 V	A/C pushbutton control module (N22), Wiring.										

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
25.0	P0600	CAN data bus		Ignition: OFF	59 – 61 Ω	Data line, IFI control module (N3/7). ⇒ 25.1
25.1		CAN element in RCL control module (N54) Resistance		Ignition: OFF Remove connector on IFI control module (N3/7)	118 – 122 Ω	RCL control module (N54), Data line, ⇒ 25.2
25.2		Data bus		Ignition: OFF Remove connectors on IFI control module (N3/7) and RCL control module (N54)	< 1 Ω	Wiring.
26.0	P1475 P0200	Resonance intake line switchover valve (Y22/6) Voltage		Engine: at CTP (idle) 660 rpm ± 10 1500 rpm ± 10	11 – 14 V < 1 V	IFI control module (N3/7), Wiring, Resonance intake line switchover valve (Y22/7) (Figure 14), ⇒ 26.1
26.1		Current draw		Ignition: ON	0.4 A	Resonance intake line switchover valve (Y22/7) (Figure 14).


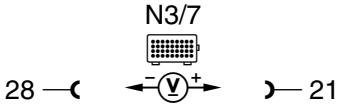
Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
27.0	P1476 P0200	Resonance intake manifold switchover valve (Y22/7) Voltage		Engine: at CTP (idle) 660 rpm ± 10 3700 rpm ± 10	11 – 14 V < 1 V	IFI control module (N3/7), Wiring, Resonance intake manifold switchover valve (Y22/6) (Figure 14), ⇒ 27.1
27.1		Current draw		Ignition: ON	0.4 A	Resonance intake manifold switchover valve (Y22/6) (Figure 14).
28.0		Signal for tachometer TD signal	 	Engine: at CTP (idle) Engine: at CTP (idle)	Signal see Figure 15 > 0.8 V Increasing rpm = increasing voltage	IFI control module (N3/7).

1) Test with multimeter only if oscilloscope is not available.


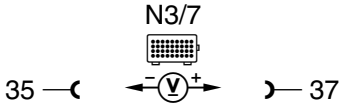
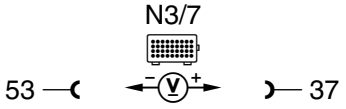
2) Test with oscilloscope. This test can be performed at idle speed with the Bear DACE engine analyzer. Set time axis to 25 milliseconds.

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
29.0		Non-USA vehicles only.				
30.0	P1401 P0403	EGR lifting sender (B28/3)		Engine: at CTP (idle) ⁷⁾ Accelerate briefly, then Engine: at CTP (idle)	< 1.5 V < 100 mbar > 1.5 V > 150 mbar	⇒ 30.1
30.1		EGR valve leakage Remove vacuum line and connect pressure tester		Ignition: OFF Apply 400 mbar vacuum to EGR valve. Pull off vacuum line.	EGR valve closes audibly	EGR valve (see 31, Figure 1)

⁷⁾ If EGR was recirculated previously, a waiting time of 50 seconds must be observed, after that, the values can be checked.

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
31.0	P0400	EGR valve vacuum transducer (Y31/1) Vacuum at outlet “OUT” of vacuum transducer		Engine: at CTP (idle) ⁷⁾ 660 ± 10 rpm 2000 ± 100 rpm Briefly apply WOT ⁶⁾	< 1.0 V < 150 mbar > 2 V > 200 mbar < 1.0 V < 150 mbar	IFI control module (N3/7), Vacuum transducer (Y31/1), Vacuum lines, Wiring, Vent filter dirty.
32.0	P1470 P0120	Pressure control flap vacuum transducer (Y31/2) Vacuum at outlet “OUT” of vacuum transducer		Engine: at CTP (idle) 660 ± 10 rpm ⁷⁾ Accelerate briefly, then Engine: at CTP (idle) for approx. 50 seconds	< 1.5 V < 150 mbar > 2.5 V >200 mbar	IFI control module (N3/7), Vacuum transducer (Y31/2), Vacuum lines, Wiring, Vent filter dirty.

⁶⁾ Briefly apply WOT, vacuum and voltage decrease. The test values are reference values.

⁷⁾ If EGR was recirculated previously, a waiting time of 50 seconds must be observed, after that, the values can be checked.

Electrical Test Program – Test

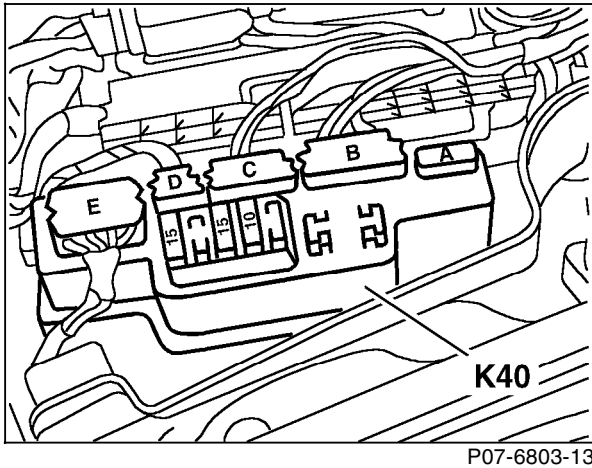


Figure 1
K40 Relay module

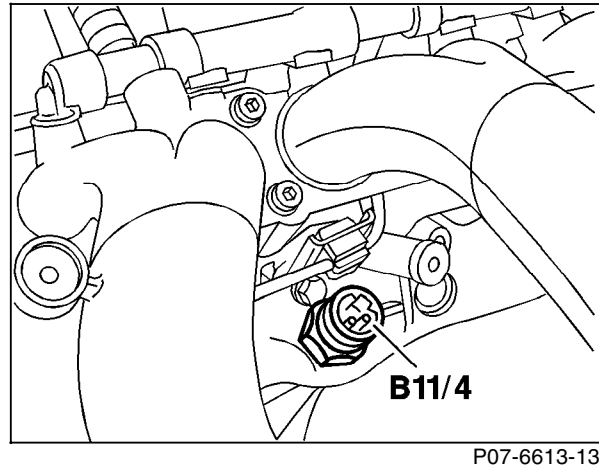


Figure 2
B11/4 ECT sensor (IFI)

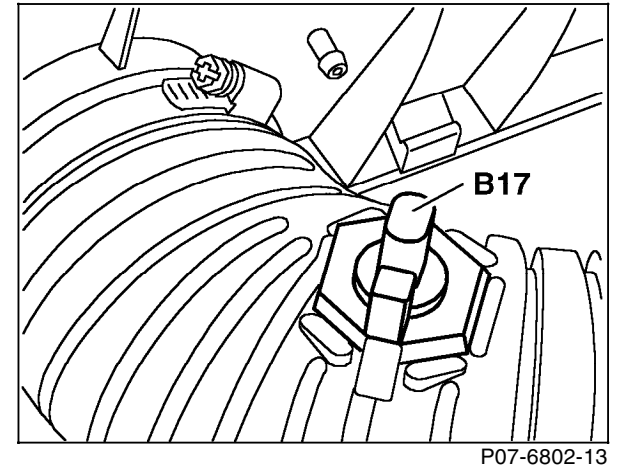
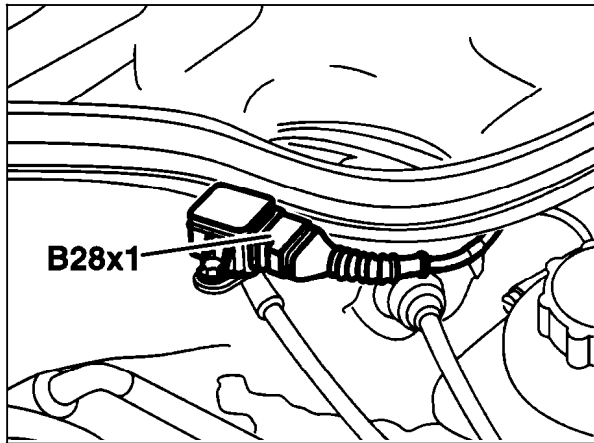


Figure 3
B17 IAT sensor

Electrical Test Program – Test



P07-6145-13

Figure 4
B28x1 Pressure sensor connector

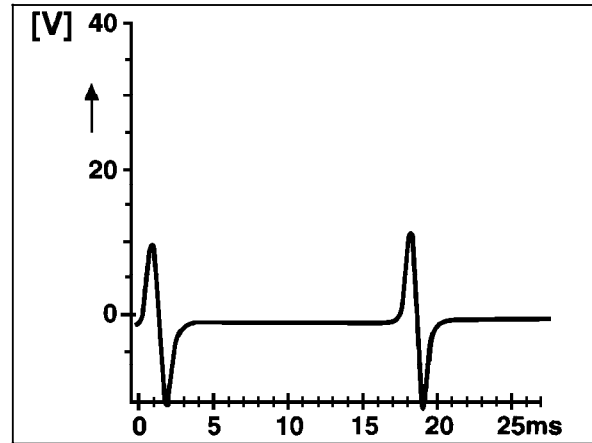
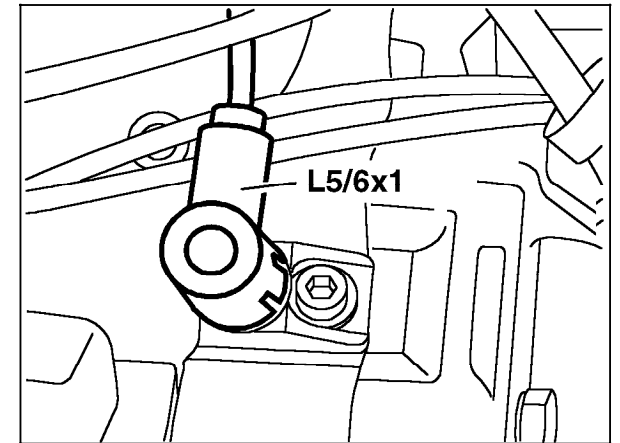


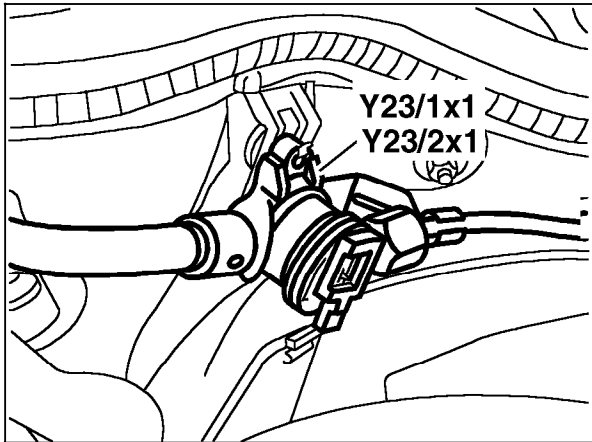
Figure 5
Signal, CKP sensor (L5/6)



P07.12-0239-13

Figure 6
L5/6x1 CKP sensor connector (IFI)

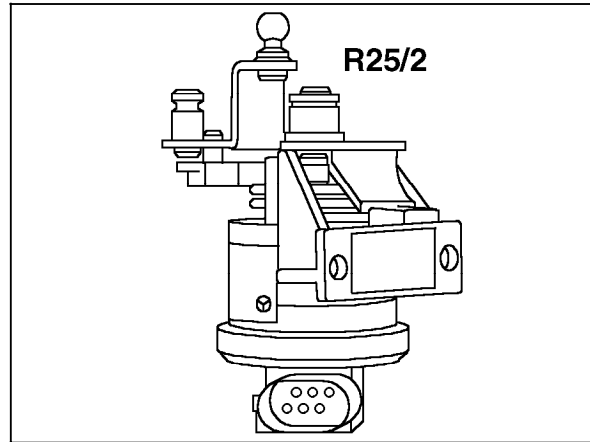
Electrical Test Program – Test



P07.12-0240-13

Figure 7

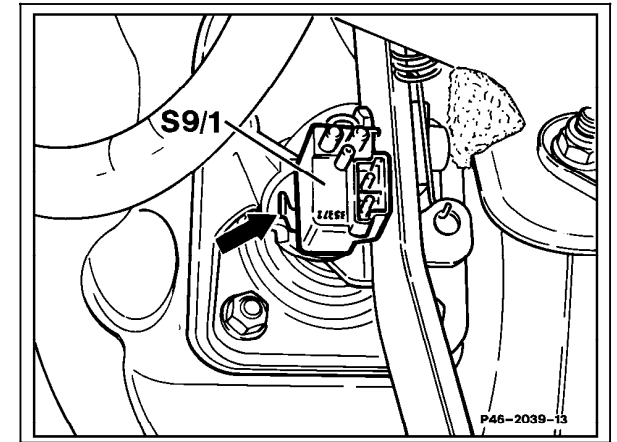
Y23/1x1 Fuel metering actuator (IFI) connector



P07-6686-13

Figure 8

R25/2 IFI accelerator pedal position sensor



P46-2039-13

Figure 9

S9/1 Stop lamp switch (4-pole) (footwell cover panel removed)

Electrical Test Program – Test

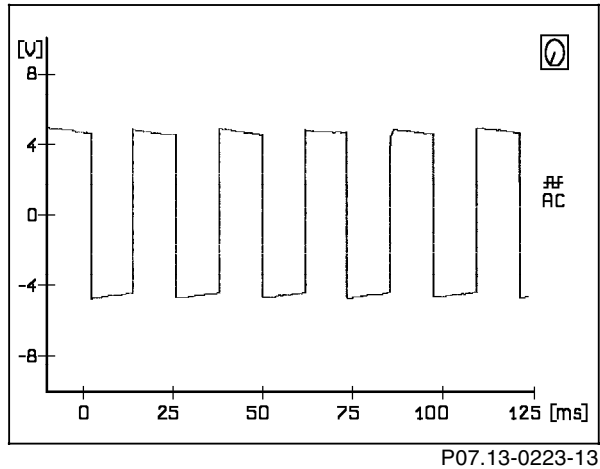


Figure 10
VSS from ETS control module

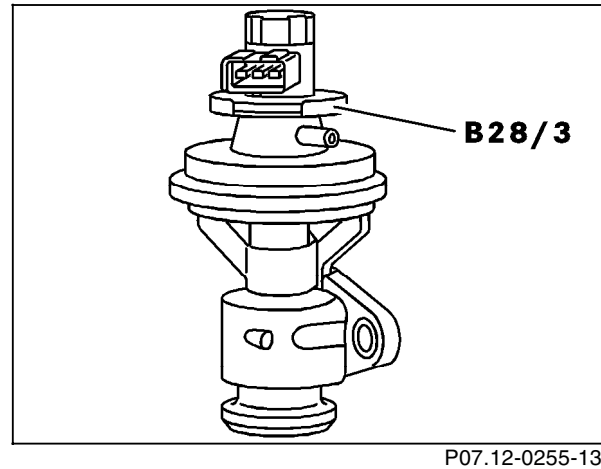


Figure 11
B28/3 EGR lifting sender

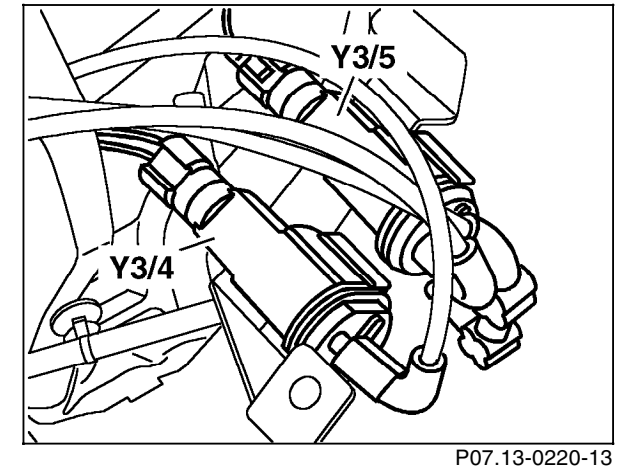


Figure 12
Y3/4 Modulating pressure switchover valve (AT/CC)
Y3/5 Upshift delay switchover valve (AT/CC)

Electrical Test Program – Test

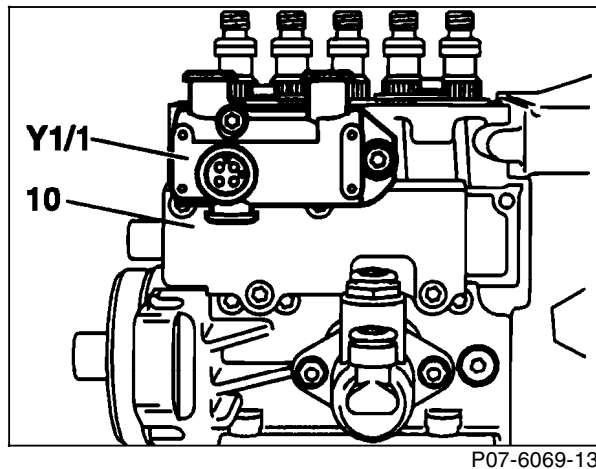


Figure 13

- 10 In-line fuel injection pump
- Y1/1 IFI electrohydraulic shut-off valve

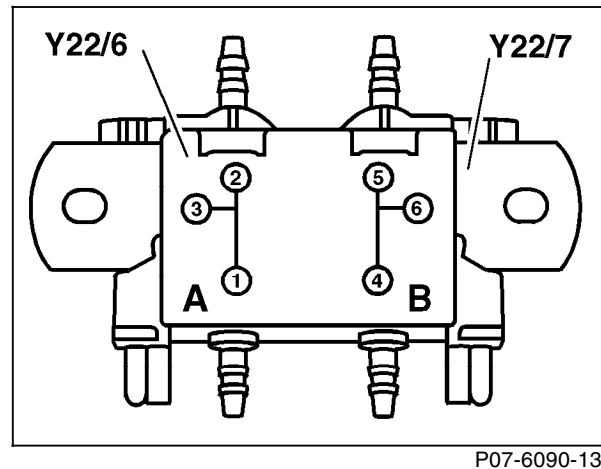


Figure 14

- Y22/6 Resonance intake manifold switchover valve
 - Y22/7 Resonance intake line switchover valve
- Note:** The resonance intake line switchover valve (Y22/7) is installed towards the engine.

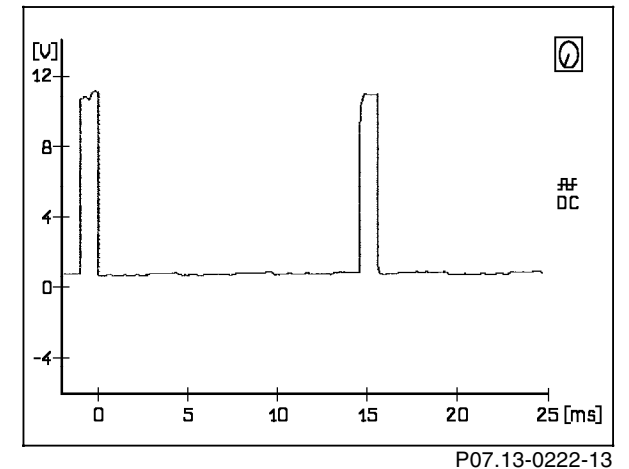


Figure 15

TD-signal for rpm sensor

Electrical Test Program – Test

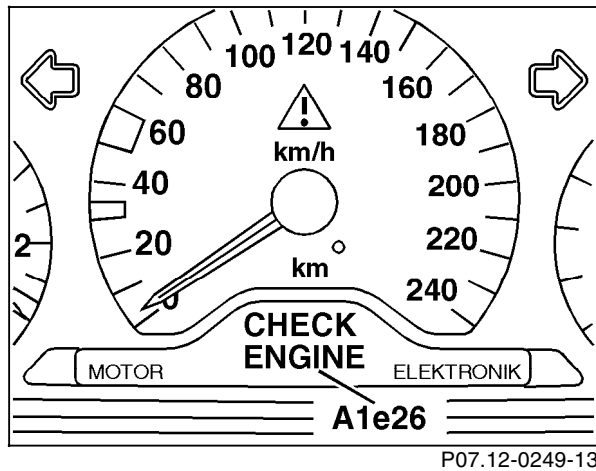


Figure 16
A1e26 CHECK ENGINE MIL in multi-function display

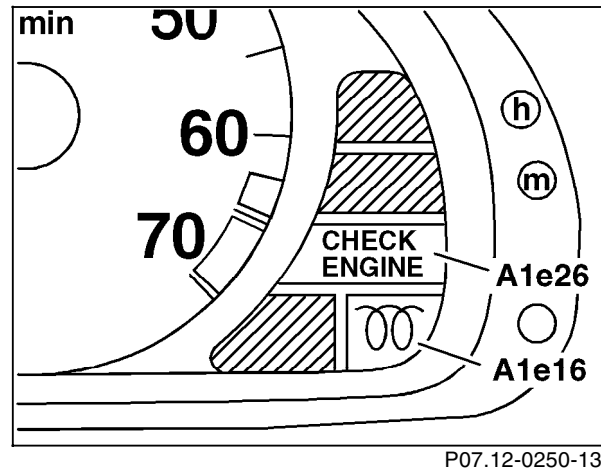


Figure 17
A1e16 Preglow indicator lamp
A1e26 CHECK ENGINE MIL in instrument cluster

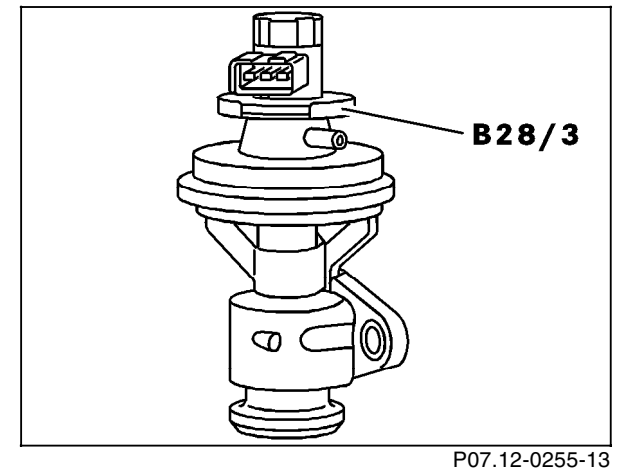
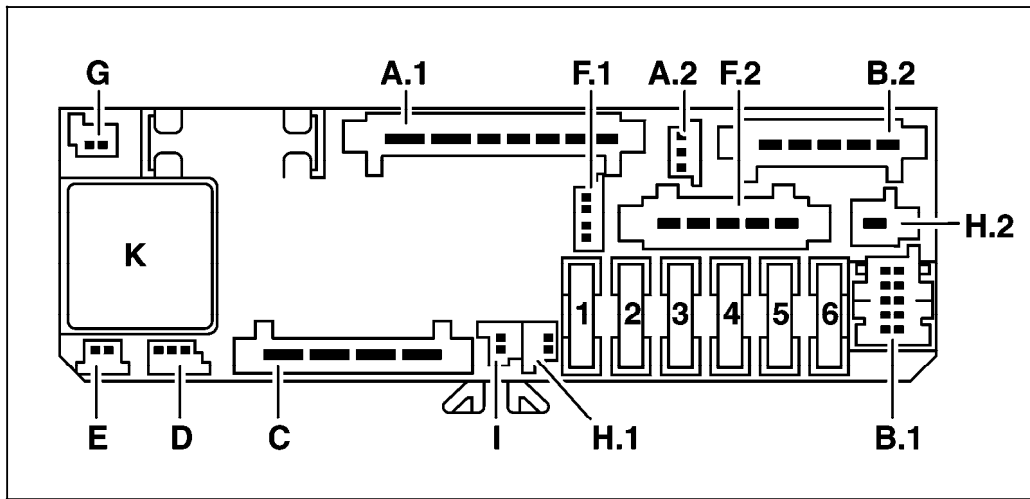


Figure 18
B28/3 EGR lifting sender





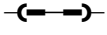







P07.13-0425-10

Figure 18

Connector location for passenger side fuse and relay module box (K40/4)

Electrical Test Program – Test (Preglow System)

Operation No. of Text description and Time Allowance 15-4000



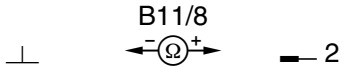
⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
1.0		Preglow indicator lamp (A1e16)	<p>N14</p> <p>1 — (1.1)  3 — (1.3)</p>	Unplug preglow time-limit relay module (N14) Ignition: ON	Preglow indicator lamp (A1e16) lights	Light bulb, Wiring, ⇒ 1.1
1.1			<p>N14</p> <p>3 — (1.3)  N3/7 48</p>	Ignition: OFF Unplug preglow time-limit relay module (N14)	< 1 Ω	Wiring.
2.0		Preglow time-limit relay module (N14) Voltage supply	<p>N14</p> <p>4 — (1.4)  1 — (1.1)</p>	Unplug preglow time-limit relay module (N14) Ignition: ON	11 – 14 V	Fuse, Wiring, Ground, component compartment - left (W16/3), ⇒ 2.1
2.1		Circuit 30	<p>  N14 Cir. 30</p>	Unplug preglow time-limit relay module (N14). Ignition: OFF	11 – 14 V	Wiring, ⇒ 2.2
2.2		Circuit 15	<p>  N14 1 — (1.1)</p>	Unplug preglow time-limit relay module (N14). Ignition: ON	11 – 14 V	Fuse, Wiring, ⇒ 2.3

Electrical Test Program – Test (Preglow System)

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy	
2.3		Ground (output ground - component compartment - left) (W16/3)		N14 4 (1.4)	Unplug preglow time-limit relay module (N14). Ignition: OFF	$< 1 \Omega$	Wiring.
3.0	P1480 P0380	Glow plugs		N14 1 (2.1) 2 (2.2) 3 (2.3) 4 (2.4) 5 (2.5) 6 (2.6)	Measure with DC current pickup. (2.1) Remove windshield washer fluid container, remove cable cover and loosen cable ties, pull back protective sleeve. (2.2) Turn ignition key for each measurement again to position 2.	8 – 15 A ¹⁾	Glow plugs (Figure 2), Wiring.

1) After 10 – 20 seconds the nominal value is obtained for a brief moment.

Electrical Test Program – Test (Preglow System)

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy																				
4.0	P1480 P0380	ECT sensor (B11/8)		Ignition: OFF Unplug preglow time-limit relay module (N14).	<table border="0"> <tr> <td>°C</td> <td>Ω</td> </tr> <tr> <td>20</td> <td>2500</td> </tr> <tr> <td>30</td> <td>1700</td> </tr> <tr> <td>40</td> <td>1170</td> </tr> <tr> <td>50</td> <td>830</td> </tr> <tr> <td>60</td> <td>600</td> </tr> <tr> <td>70</td> <td>435</td> </tr> <tr> <td>80</td> <td>325</td> </tr> <tr> <td>90</td> <td>245</td> </tr> <tr> <td></td> <td>± 5%</td> </tr> </table>	°C	Ω	20	2500	30	1700	40	1170	50	830	60	600	70	435	80	325	90	245		± 5%	Engine coolant temperature sensor (B11/8, Figure 1), Wiring, ⇒ 4.1
°C	Ω																									
20	2500																									
30	1700																									
40	1170																									
50	830																									
60	600																									
70	435																									
80	325																									
90	245																									
	± 5%																									
4.1		Engine coolant temperature sensor (B11/8)		Ignition: OFF Unplug connector on engine coolant temperature sensor (B11/8).	Nominal value see ⇒ 4.0	Engine coolant temperature sensor (B11/8) (Figure 1)																				

Electrical Test Program – Test (Preglow System)

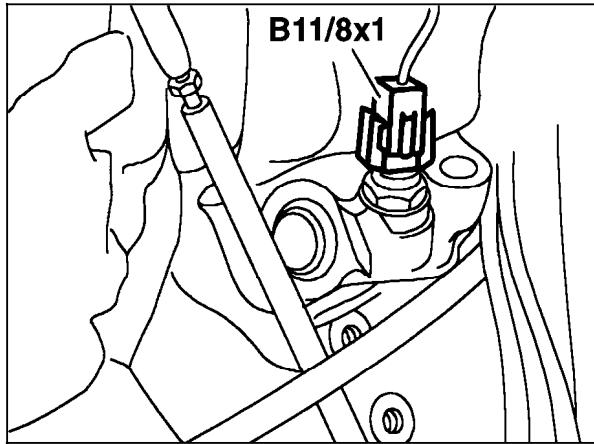


Figure 1
B11/8x1 ECT sensor (preglow system) connector

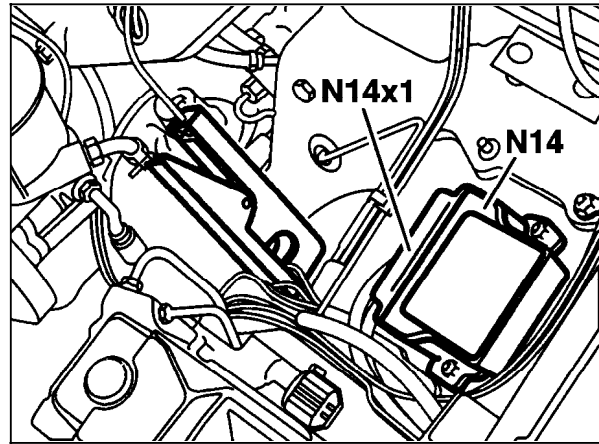


Figure 2
Current pickup over wire to glow plug
N14x1 Preglow time-limit relay module connector

Vacuum Line Routing

Engine 606.912, Model 210

Figure 1

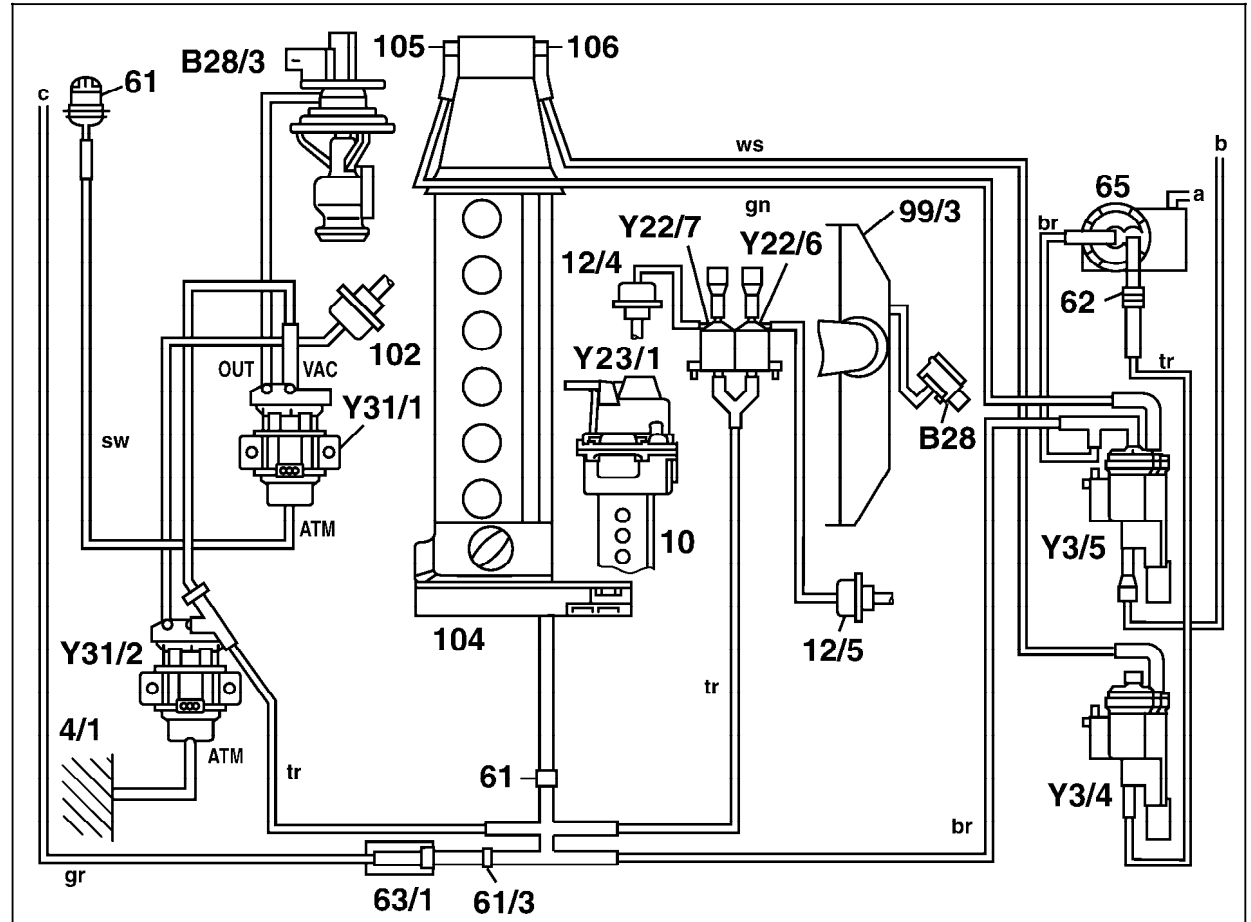
- 4/1 Air filter upper housing
- 10 In-line fuel injection pump
- 12/4 Resonance intake line vacuum element
- 12/5 Resonance intake manifold vacuum element
- 61 Filter
- 61/3 Orifice, orange
- 62 Damper
- 63/1 Check valve, automatic A/C
- 65 Vacuum control valve
- 99/3 Resonance intake manifold
- 102 Pressure control flap vacuum element
- 104 Vacuum pump
- 105 Upshift delay vacuum element
- 106 Modulating pressure vacuum element

- ATM Vent to component compartment
- OUT Outlet from vacuum transducer (Y31/2)
- VAC Vacuum supply from vacuum pump

- B28 Pressure sensor
- B28/3 EGR lifting sender
- Y3/4 Modulating pressure switchover valve (AT/CC)
- Y3/5 Upshift delay switchover valve (AT/CC)
- Y22/6 Resonance intake manifold switchover valve
- Y22/7 Resonance intake line switchover valve
- Y23/1 Fuel quantity actuator (IFI)
- Y31/1 EGR valve vacuum transducer
- Y31/2 Pressure control flap vacuum transducer

- br brown
- gr grey
- tr transparent
- gn green
- sw black
- ws white

- a Vent
- b Vent to passenger compartment
- c Remaining consumers



P07.12-0245-57