1.4 Model 140

Diagnosis – Function Test

General Information

- There are 9 test modes available which are indicated via the outside temperature display. The test mode number is indicated after the decimal point.
  Example: Test mode 1 "Fuel tank display", appears as "80.1", which means 80 liters and test mode 1.

- During test mode 2, "Momentary fuel consumption in liters per hour," consumption values of less than 9.9 l/h are shown multiplied by 10:
  Example: "34.2" corresponds to 3.4 l/h - test mode 2.
  During an momentary consumption of greater than 10 l/h, the consumption and display are identical. This is indicated by a colon (:) in front of the display figures:
  Example: ":12.2" corresponds to 12 l/h - test mode 2.

- Under driving conditions the display switches automatically to miles per gallon.

Note:

- The test values that are indicated during diagnostics in the outside temperature display correspond to metric units of measure. A direct comparison between analog and digital displays is not possible. A comparison is only broadly possible.
  Examples:

Fuel tank reading:	Analog in gallons, Digital in liters,
Fuel consumption gauge:	Analog in miles per gallon, Digital in liters per hour.

Activation of Test Modes (displayed via outside temperature indicator window)

- Ignition: **ON**

- Depress center of clock adjusting knob "A" (23 Fig. 1) for at least 5 seconds and the first test mode display will appear in the outside temperature display window.

- Pull out clock adjusting knob "B" and turn clockwise (23 Fig. 1) to activate the next test mode. For each additional test mode, the clock adjusting knob "B" must be pulled out and turned again clockwise.

Note:
When the ignition is turned **OFF**, the test mode routine is canceled.

Diagnosis – Function Test

Notes:

Prerequisite for test modes 2 – 4 → Engine: **at Idle**

To perform all 9 test modes, it is advisable to start the engine before activating the test modes.

Diagnostic Test Mode Identification

Test mode no.	Function/component	Digital readout (example)	Corresponds to:
1	Fuel tank contents in liters	80.1	80 liters
2	Momentary fuel consumption in miles per gallon	34.2 12.2	3.4 liter per hour 12 liter per hour
3	Engine oil pressure in bar	20.3	2.0 bar
4	Engine rpm (x 100)	41.4	4100 rpm
5	Engine oil level	0.5 1.5	0= Oil level OK 1= Oil level not OK
6	Activation of oil pressure, fuel consumption and fuel tank gauges	0.6	Needle in first quarter of gauge dial (23, Figure 2)
7	Activation of oil pressure, fuel consumption and fuel tank gauges	0.7	Needle in second quarter of gauge dial (23, Figure 3)
8	Activation of fuel consumption and fuel tank gauges	0.8	Needle in third quarter of gauge dial, the oil pressure gauge stays in second quarter of dial (23, Figure 4).
9	Activation of fuel tank gauge	0.9	Needle in fourth quarter of gauge dial, oil pressure gauge remains in second quarter, fuel consumption gauge remains in third quarter of gauge dial. (23, Figure 5)

Diagnosis – Complaint Related Diagnostic Chart

Instrument Cluster

Complaint/Problem	Possible cause	Remedy/Test step [1]
Entire instrument cluster (A1) not functioning.	Power supply, Electronic circuit board.	23 ⇒ 1.0
Indicator lamps for ABS, ASR, charge control, brake pad wear, brake fluid, parking brake and ADS are not functioning.	Power supply, Electronic circuit board.	23 ⇒ 1.0
Instrument cluster illumination not operating.	Bulbs (23 Figure 6), Exterior lamp switch (S1), Electronic circuit board.	23 ⇒ 2.0
Fuel tank gauge (A1p2) inaccurate or not operating.	A1p2 Reference resistor (23, Figures 7 and 8) Fuel level sensor (B4)	23 ⇒ 3.0
Fuel consumption gauge (A1p10) inaccurate or not operating.	A1p10 Fuel consumption signal from LH-SFI, EDS control module or engine control module (HFM-SFI)	23 ⇒ 4.0
Oil pressure gauge with warning lamp (A1p3) inaccurate or not operating.	A1p3 Oil pressure sensor (B5)	23 ⇒ 5.0
Oil pressure gauge with warning lamp (A1p3) stays on continuously.	Oil pressure sensor (B5) Electronic circuit board	23 ⇒ 5.0 23 ⇒ 6.0

[1] Observe Preparation for Test, see 22.

Diagnosis – Complaint Related Diagnostic Chart

Instrument Cluster (continued)

Complaint/Problem	Possible cause	Remedy/Test step [1]
Tachometer (A1p5) inaccurate or not operating.	A1p5 TN-signal	23 ⇒ 7.0
Oil level indicator lamp (A1e12) lights up but oil level is OK.	Oil level switch (S43)	23 ⇒ 8.0
Electronic speedometer (A1p8) inaccurate or not operating.	Electronic circuit board [2] A1p8 Vehicle speed signal from ABS or ASR control module (N30 or N30/1)	23 ⇒ 9.0
Outside temperature display (A1p4) inaccurate or not operating.	Electronic circuit board [2] A1p4 Outside temperature sensor (B14)	23 ⇒ 10.0
ECT gauge (A1p1) inaccurate or not operating.	A1p1 ECT sensor (B13)	23 ⇒ 11.0

1) Observe Preparation for Test, see 22.
2) Verify that correct part number/version is installed.

Electrical Test Program – Component Locations

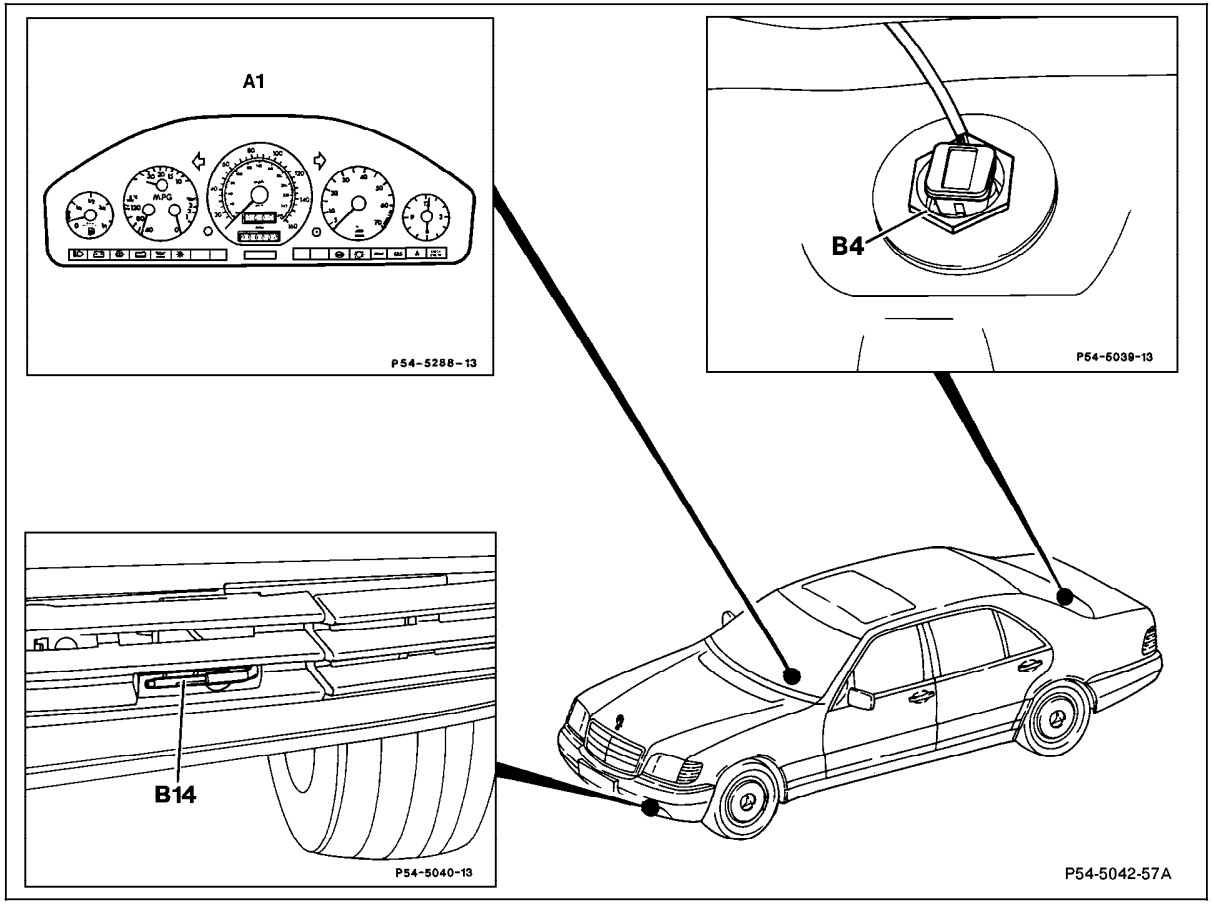

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Figure 1

A1	Instrument cluster
B4	Fuel level sensor
B14	Outside temperature indicator temperature sensor

Electrical Test Program – Component Locations

Vehicles with LH-SFI engines
(Layout of module box on vehicles with HFM-SFI engine, see 23)

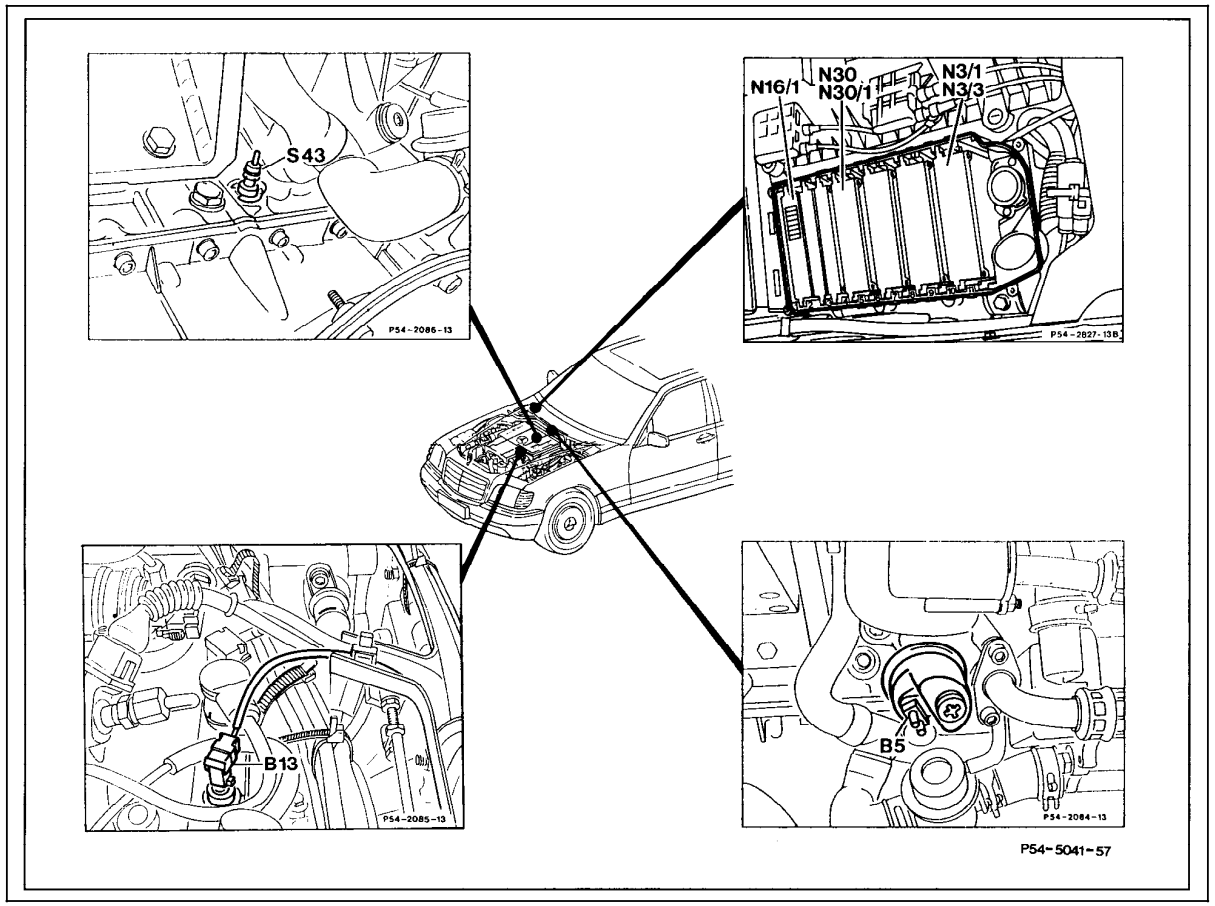

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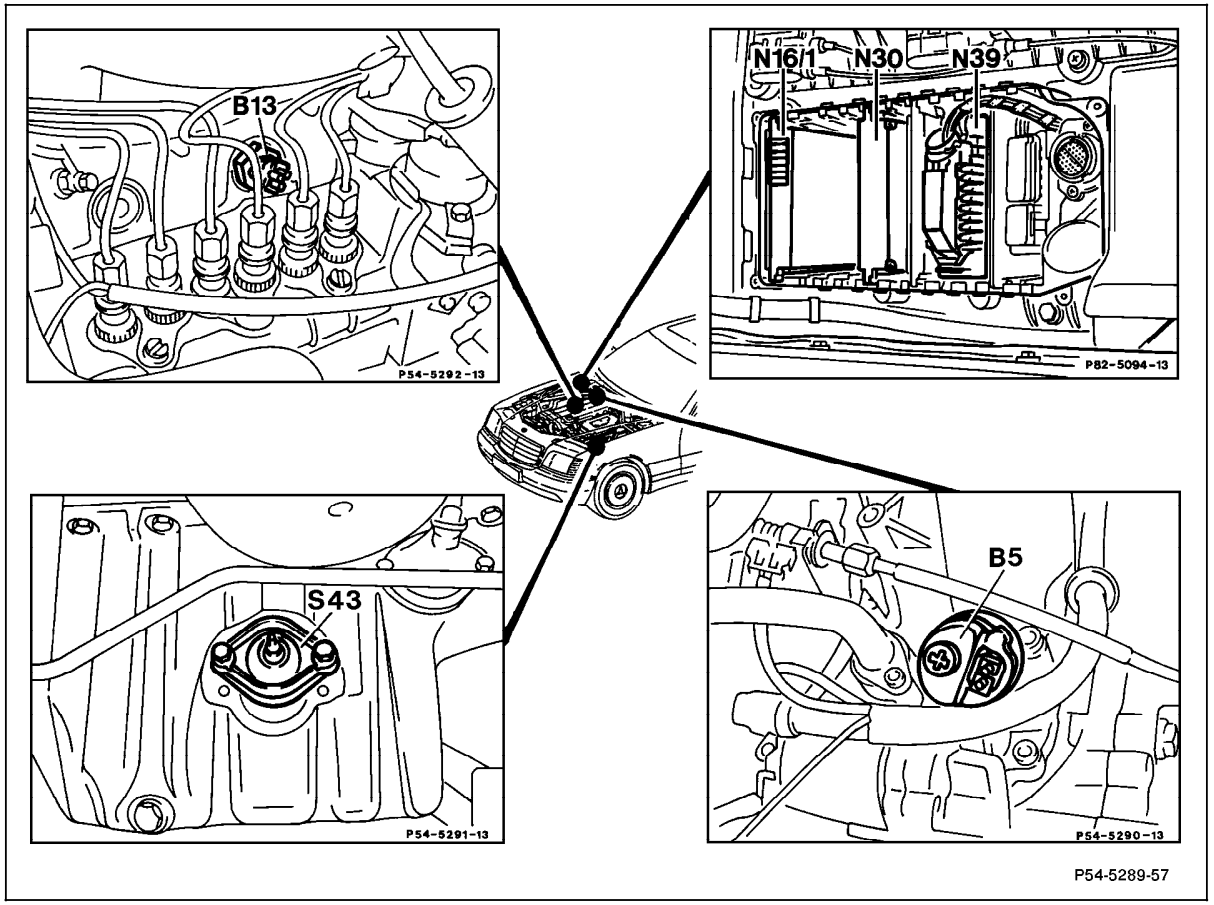
Figure 2

B5	Oil pressure sensor
B13	ECT gauge sensor
N3/1	LH-SFI control module
N3/3	Right LH-SFI control module
N16/1	Base module
N30	ABS control module
N30/1	ASR control module
S43	Oil level switch

Electrical Test Program – Component Locations

Vehicles with diesel engines



P54-5289-57

Figure 3

B5	Oil pressure sensor
B13	ECT gauge sensor
N16/1	Base module
N30	ABS control module
N39	EDS control module
S43	Oil level switch

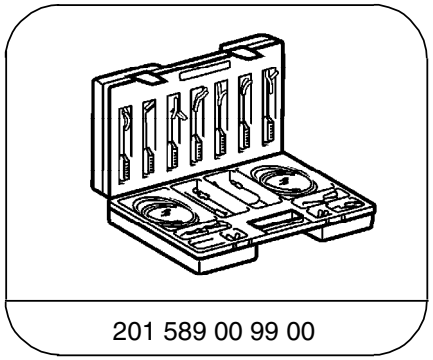
Electrical Test Program – Preparation for Test

1. Battery voltage 11 – 14 V.
2. Check fuses.
3. Systems and fluid levels in order.

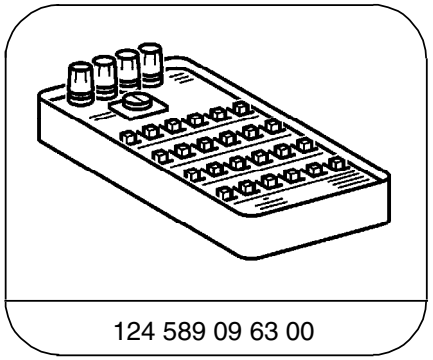
Note:
To prevent damage to the control modules refered to in 23, the connectors on the control modules must only be removed or installed with the ignition **OFF**.

Electrical wiring diagrams
See Electric Troubleshooting Manual, Model 140, Volume 2.

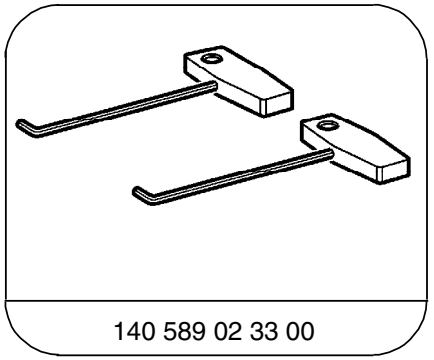
Special Tools



201 589 00 99 00
Electrical connecting set



124 589 09 63 00
Ohm decade



140 589 02 33 00
Extraction hook

Equipment

Multimeter [1)]	Fluke models 23, 83, 85, 87
Signal generator [1)]	SUN DTR-8416

1) Available through the MBUSA Standard Equipment Program.

Electrical Test Program – Test

Test step **Test mode**	Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
⇒ 1.0	**Instrument cluster (A1)** Voltage supply Circuit 30	A1 11 (2) — (V) — 12 (2)	Remove A1, Disconnect connector 2.	11 – 14 V	Wiring, ⇒ 1.1
⇒ 1.1	Voltage supply Circuit 15, unfused	A1 10 (1) — (V) — 1 (1)	Remove A1, Disconnect connector 1. Ignition: **ON**	11 – 14 V	Wiring, ⇒ 1.2
⇒ 1.2	Voltage supply Circuit 15, fused	A1 10 (1) — (V) — 5 (1)	Remove A1, Disconnect connector 1. Ignition: **ON**	11 – 14 V	Wiring, Values OK: Electronic circuit board.
⇒ 2.0	**Instrument cluster (A1)** Illumination	A1 10 (1) — (V) — 8 (1)	Remove A1, Disconnect connector 1. Ignition: **ON** Turn on parking lights.	11 – 14 V	Wiring, Exterior lamp switch (S1).
⇒ 3.0 **1**	**Fuel level gauge (A1p2)**		Activate test mode 1 (see Figure 1).	Analog fuel gauge reading digital readout	A1p2, ⇒ 3.1

Electrical Test Program – Test

Test step **Test mode**	Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
⇒ 3.1 **6 – 9**	A1p2		Activate test modes 6 – 9.	Figures 2 – 5	A1p2, ⇒ 3.2
⇒ 3.2	Wires and connections or fuel level sensor (B4)	B4 1 —( )— 2	Ignition: **OFF** Disconnect connector at B4. Connect resistance substitution unit. Ignition: **ON** **Resistance substitution unit setting:** 70 ± 3 Ω 62 ± 1 Ω 53 ± 2 Ω 37 ± 2 Ω 21 ± 2 Ω 5 ± 2 Ω **Note:** Before changing each resistance value, the ignition must be turned off and then turned on again.	**Display in A1p2:** =0 [1] =Res. [1] =1/4 =1/2 =3/4 =1/1	Wrong reference resistor installed, check reference resistor, 23 (Figures 7 and 8), Wiring, Values OK: B4.

[1] Fuel reserve warning lamps light up.

Electrical Test Program – Test

Test step **Test mode**	Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
⇒ 4.0 **2**	**Fuel consumption indicator (A1p10)**		Engine: **at idle** Activate test mode 2, increase rpm.	With increasing rpm the consumption in l/h increases. **Note:** The display can only be read on the digital display. The analog reading shows ∞.	⇒ 4.1.
⇒ 4.1 **6 – 8**			Activate test modes 6 – 8.	See Figures 2 – 5	A1p10, ⇒ 4.2.

Electrical Test Program – Test

Test step **Test mode**	Test Scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
⇒ 4.2	Fuel consumption signal from: LH-SFI control module (N3/1, N3/3) or Engine control module (N3/4) or EDS control module (N39)	**LH-SFI control module** N3/1 or N3/3 W3/3 ◄–(G)+► 9 (1) **Engine control module** N3/4 W3/3 ◄–(G)+► 7 (1) **EDS control module** N39 W3/3 ◄–(G)+► 13 (1)	Ignition: **OFF** Remove N3/1, N3/3, N3/4 or N39 (Figure 9, 10, 14 and 15). Connect signal generator and set to a voltage amplitude of approx. 10 V (Figure 16). Ignition: **ON** Activate test mode 2.	**LH-SFI, HFM-SFI** 25 Hz= 5 l/h 50 Hz= 10 l/h 75 Hz= 15 l/h 100 Hz= 20 l/h **EDS** 50 Hz= 5 l/h 100 Hz= 10 l/h 150 Hz= 15 l/h 200 Hz= 20 l/h **Note:** The readout is only visible on the digital display. The analog reading shows ∞.	Wiring, Electronic circuit board, Values OK: N3/1, N3/3, N3/4 or N39 Engine Vol. 2 – 1.1 23 or – 3.1 23 or – 3.2 23. **Note:** If no plausible values are indicated while driving and the speedometer is functioning correctly, replace electronic circuit board.

Electrical Test Program - Test

Test step **Test mode**	Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
⇒ 5.0 **3**	**Oil pressure gauge with warning lamp (A1p3)**		Engine: **at idle** Activate test mode 3 Increase engine rpm.	Oil pressure indicator Analog reading digital readout. The oil pressure increases with increasing engine rpm.	A1p3, ⇒ 5.1
⇒ 5.1 **6 – 7**			Activate diagnostic tests 6 – 7	See Figures 2 – 5	A1p3, Electronic circuit board, ⇒ 5.2
⇒ 5.2	Wires and connections or oil pressure sensor (B5)	B5 1 — 2	Disconnect connector at B5. Connect resistance substitution unit. Engine: **at idle** **Resistance substitution unit setting:** 13 Ω 40 Ω 90 Ω 150 Ω	**Display in A1p3:** = 0 = 1 = 2 = 3	Wiring, Electronic circuit board. Values OK: Check oil pressure (see SMS Engine, Mechanical), B5.

Electrical Test Program – Test

Test step / **Test mode**	Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
⇒ 6.0	**Oil pressure gauge with warning lamp (A1p3)** Oil pressure warning lamp function	B5 1 —❨ ▦ ❩— 2	Check oil pressure. If oil pressure is OK, disconnect connector at B5. Connect resistance substitution unit. Start engine, increase engine speed > 1200 rpm. **Resistance substitution unit setting:** 13 Ω	**Display in A1p3:** =0 Oil pressure warning lamp lights up.	⇒ 5.2, Electronic circuit board.
⇒ 7.0 **4**	**Tachometer (A1p5)**	–	Engine: **at idle** Activate test mode 4. Raise engine speed.	Analog tachometer reading digital readout.	A1p5, Electronic circuit board, ⇒ 7.1

Electrical Test Program – Test

Test step **Test mode**	Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
⇒ 7.1	A1p5 **at LH-SFI or diesel engine**	N16/1 W3/3 (G1) — 13 (1)	Remove N16/1 or N3/4 (Figures 9, 10, 14 and 15). Connect signal generator and set to a voltage amplitude of approx. 10 V (Figure 16). Ignition: **ON**	**Engine 104, 120** 50 Hz = 1000 rpm. 194 Hz = 4000 rpm. **Engine 119** 70 Hz = 1000 rpm. 270 Hz = 4000 rpm. **Engine 603** 2400 Hz = 1000 rpm. 9600 Hz = 4000 rpm.	Wiring, Electronic circuit board, Values OK on LH-SFI or diesel engine: N16/1 DM, Chassis and Drivetrain, Vol. 1 – 1.1 or 1.2 23.
	at HFM-SFI engine	N3/4 W3/3 (G1) — 18 (1)			Values OK on HFM-SFI engine: N3/4

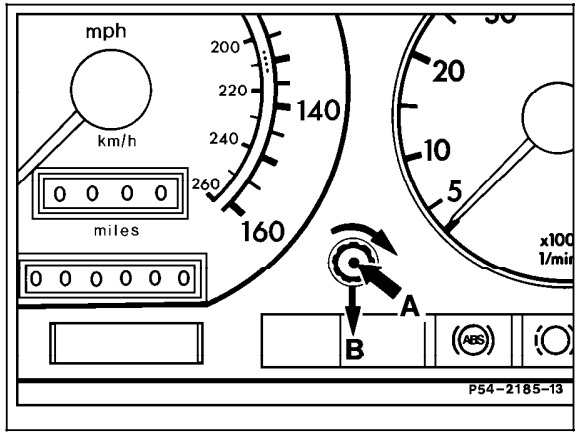
Electrical Test Program – Test

Test step / Test mode	Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
⇒ 8.0 **5**	**Low engine oil level indicator lamp (A1e12)**		Engine oil level OK (check with dipstick) Engine: **at idle** Activate test mode 5.	Digital readout 0.5 = oil level indicator lamp **OFF**, oil level correct. Digital readout 1.5 = oil level indicator lamp **ON**, oil level incorrect.	Wiring, Oil level switch (S43).
⇒ 9.0	**Electronic speedometer (A1p8)**	**ABS only** W3/3 ◄–(G)+► N30 ❩— 3 (1) **ASR (with ABS)** W3/3 ◄–(G)+► N30/1 ❩— 36 (1)	Remove N30 or N30/1, (Figure 9 and 10). Connect signal generator and set to a voltage amplitude of approx. 10 V (Figure 16). Ignition: **ON**	With increasing frequency the speed on the speedometer must increase.	Wiring, Electronic circuit board. Values OK: N30 or N30/1 DM, Chassis and Drivetrain, Vol. 2 – 6.2 23 or – 5.2 23.

Electrical Test Program – Test

Test step **Test mode**	Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
⇒ 10.0	**Outside temperature display (A1p4)**	X24 9 —❨ ▦ ❩— 10	Disconnect headlamp harness connector (X24, Figure 11). Connect resistance substitution unit. Ignition: **ON** **Resistance substitution unit setting:** 53 kΩ 9.8 kΩ 1 kΩ	 **Display in A1p4:** = – 30°C = 0°C = + 50°C	Wiring, A1p4, Electronic circuit board. Values OK: Check outside temperature sensor (B14).
⇒ 11.0	**ECT gauge (A1p1)**	**Gasoline engine** B13 W11 —❨ ▦ ❩— **Diesel engine** B13 W11 —❨ ▦ ❩—	Disconnect plug at ECT gauge sensor (B13). Connect resistance substitution unit. Ignition: **ON** **Resistance substitution unit setting:** 110 Ω 67 Ω 38 Ω 20 Ω	 **Display in A1p1:** = 60 °C = 80 °C = 100 °C = 120 °C	Wiring, A1p1, Values OK: B13.

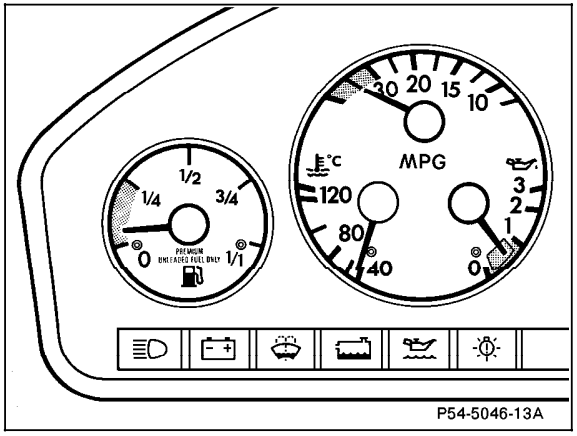
Electrical Test Program – Test



P54-2185-13

Figure 1

Activation of diagnostic code

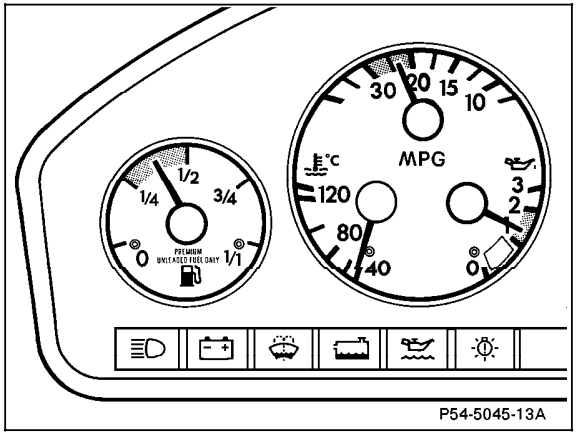


P54-5046-13A

Figure 2

Activation of instruments

1st quarter: Fuel tank
Fuel consumption
Oil pressure



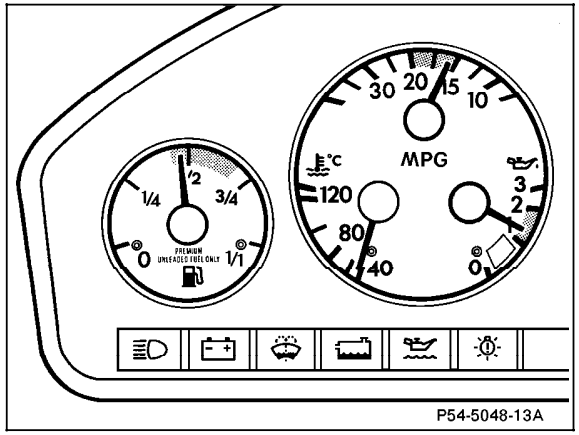
P54-5045-13A

Figure 3

Activation of instruments,

2nd quarter: Fuel tank
Fuel consumption
Oil pressure

Electrical Test Program – Test

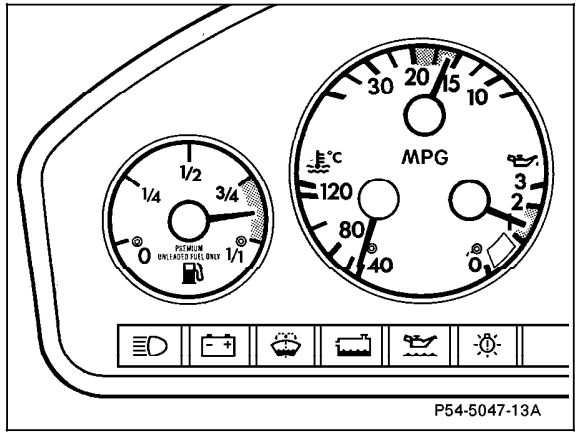


P54-5048-13A

Figure 4

Activation of instruments,

2nd quarter:	Oil pressure
3rd quarter:	Fuel tank
	Fuel consumption

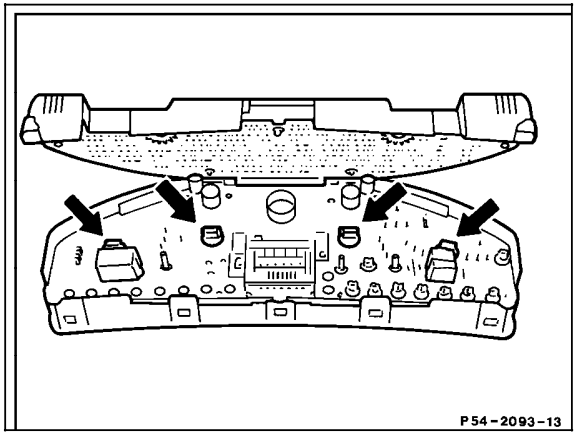


P54-5047-13A

Figure 5

Activation of instruments,

2nd quarter:	Oil pressure
3rd quarter:	Fuel consumption
4th quarter:	Fuel tank



P54-2093-13

Figure 6

Instrument cluster illumination

Electrical Test Program – Test

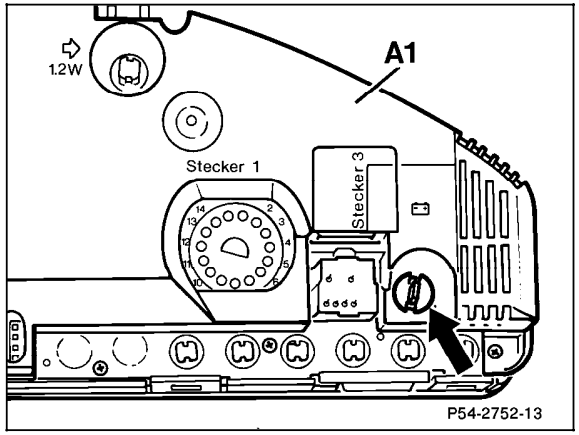


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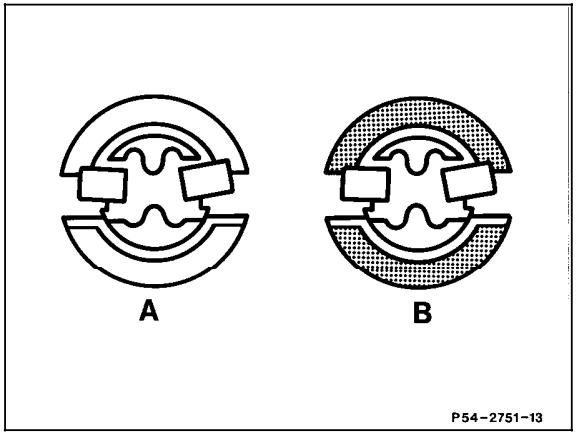
Figure 7

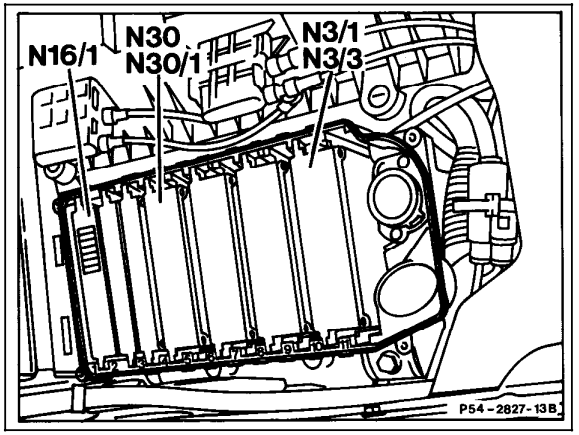
Fuel tank identification reference resistor



P54-2751-13

Figure 8

A	Reference resistor without contact rail for standard fuel tank
B	Reference resistor with contact rail for an optional European version fuel tank (not applicable for U.S. version vehicles).



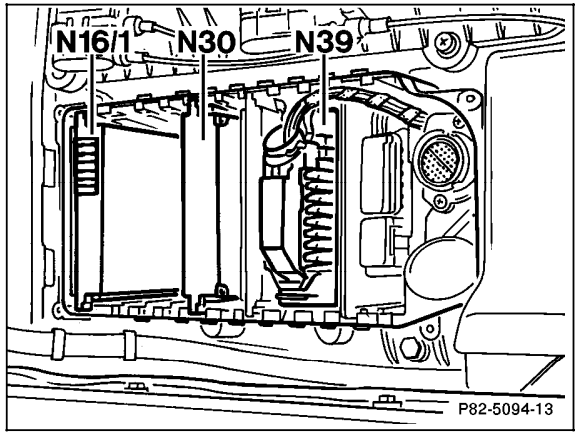
P54-2827-13B

Figure 9

Module box on vehicles with gasoline engine

N3/1	LH-SFI control module
N3/3	Right LH-SFI control module
N16/1	Base module
N30	ABS control module
N30/1	ASR control module

Electrical Test Program – Test

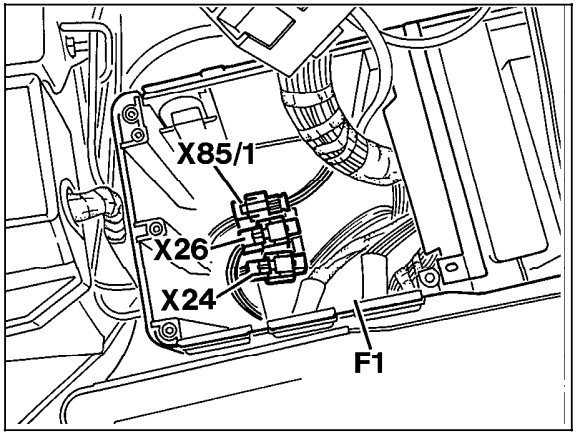


P82-5094-13

Figure 10

Module box on vehicles with diesel engine

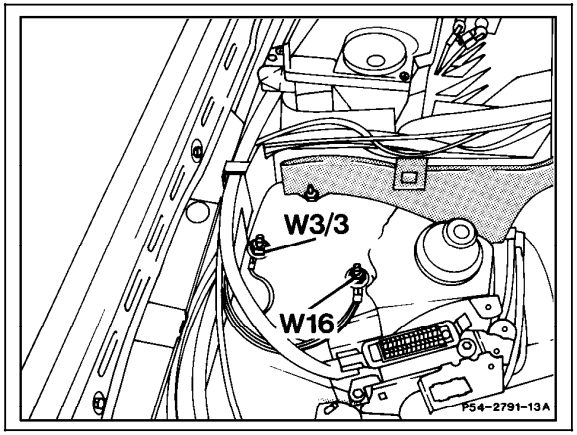
N16/1 Base module
N30 ABS control module
N39 EDS control module



P54-2864-13

Figure 11

X24 Headlamp harness connector
F1 Main fuse box



P54-2791-13A

Figure 12

W3/3 Ground (right front wheel housing)

Electrical Test Program – Test

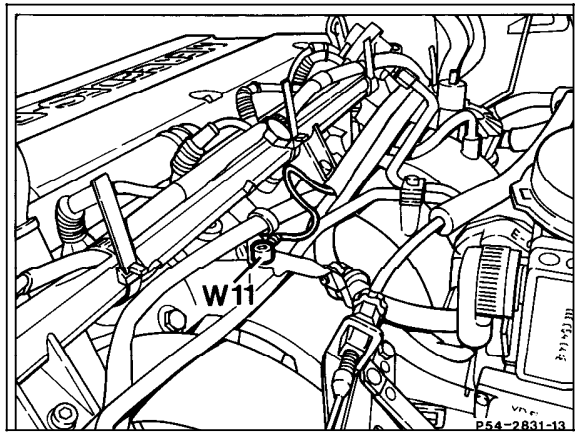


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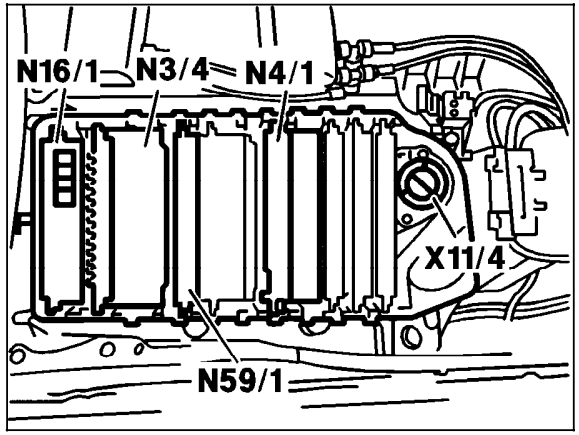
Figure 13

W11 Ground, engine (connection point for ground wires)



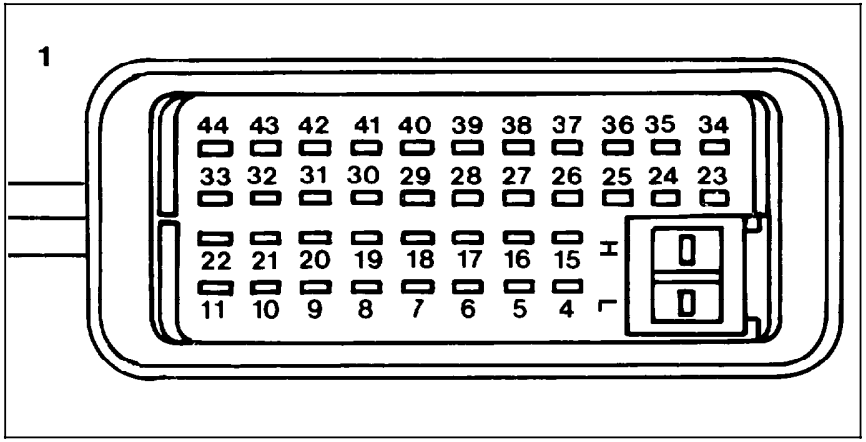
P07-5926-13

Figure 14

Module box on vehicles with HFM-SFI engine

N3/4 Engine control module (HFM-SFI)

Electrical Test program – Test



P07-5936-33

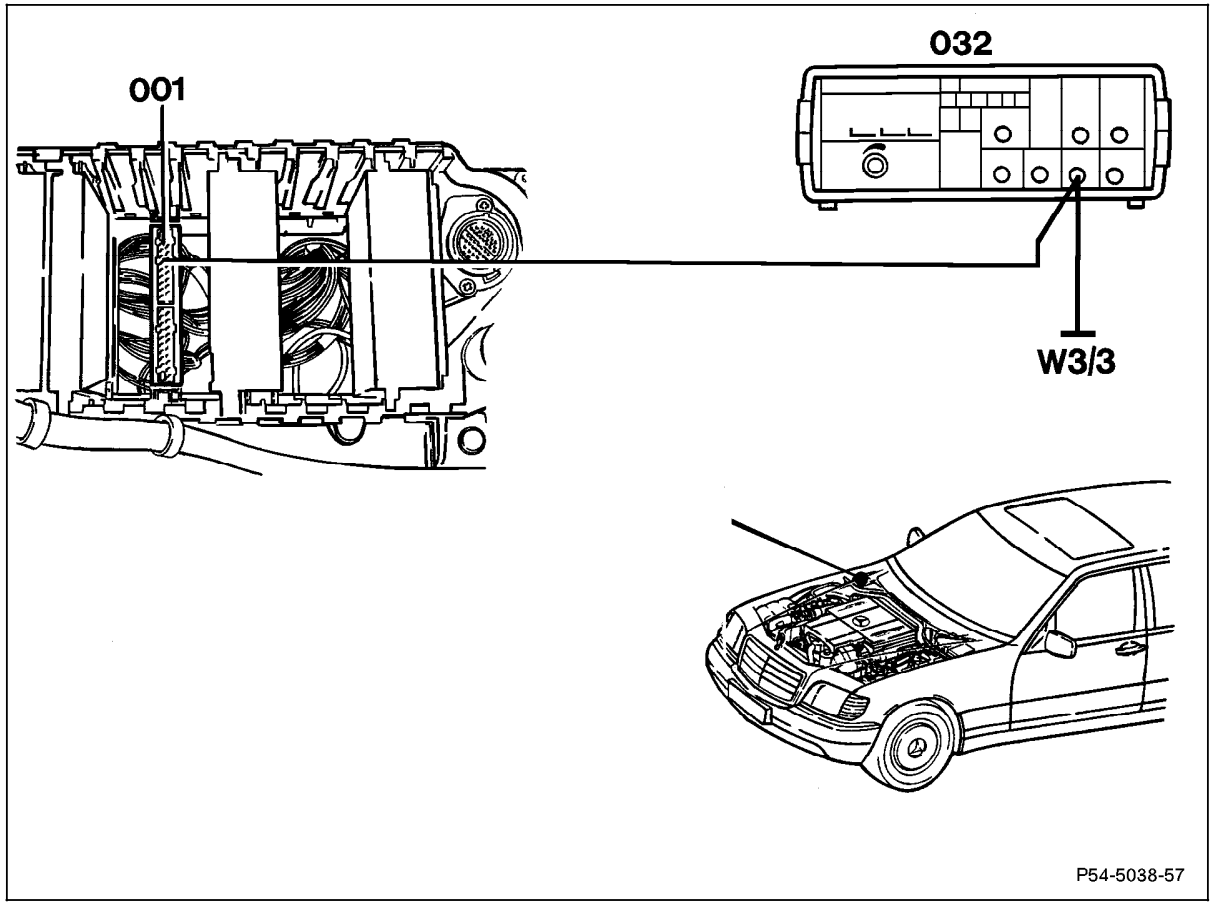
Figure 15

Engine control module (N3/4) connector “1”

7	Fuel consumption signal
18	Engine rpm output signal (TN-signal)

Electrical Test Program – Test

Connection Diagram – Signal Generator



P54-5038-57

Figure 16

001	ABS control module connector
032	Signal generator
W3/3	Ground (right front wheel housing - DI)