2.1 Continuous Fuel Injection System — Contents

2.1 Engines 104, 119

Diagnosis – Diagnostic Trouble Code (DTC) Memory

The individual test steps (e.g. ECT sensor, IAT sensor, etc.) are combined into a test program. If a complaint is confirmed during engine diagnosis in Volume 1 and a reference is made to a particular test step, only perform that test step (with respective time allowed) and not the entire test program.

Test Note:
Connect impulse counter scan tool according to connection diagram, see section 0, Connection und Use of Test Equipment.
For information on performing the On-off Ratio Test as well as recalling the DTC's with the impulse counter scan tool, see volume 1, section B 1.

a) On-off Ratio Test, Ignition: ON

In this test, the input signals to the CFI control module are tested in the respective component's static state (ignition: **ON**). **This readout mode can also be used for a quick test of the signals being monitored.**

A fixed on-off ratio of 50% indicates that all input signals are OK.
If a different on-off ratio is displayed, see Malfunction Table.

Malfunction Table On-off Ratio Test, Ignition: ON

On–off Ratio %	Possible cause	Test step/Remedy 1)
0	Not used.	–
10	CTP contact of WOT/CTP switch (S29/2) open.	23 ⇒ 17.0
20	WOT contact of WOT/CTP switch (S29/2) closed.	23 ⇒ 12.0
30	ECT not between 70 and 100 °C	23 ⇒ 13.0

1) Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

Malfunction Table **On-off Ratio Test, Ignition: ON** (*continued*)

On–off Ratio %	Possible cause	Test step/Remedy [1]
40	VAF sensor (B2) plate deflected.	23 ⇒ 14.0
50	Input signals OK.	–
60	Recognition of vehicle speed signal from electronic speedometer (A1p8).	23 ⇒ 18.0
70	Starter signal (circuit 50) recognized.	23 ⇒ 36.0 [2]
80	Transmission engaged in gear.	–
90	Electrohydraulic actuator (Y1) current implausible	23 ⇒ 10.0 – 11.0
100	Not used.	–

1) Observe Preparation for Test, see 22.
2) See DI control module.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

b) On-off Ratio Test, Engine: at Idle

In this test, the input signals to the CFI control module are checked for plausibility with the engine running at idle.
If the indicator oscillates, then there is no malfunction in the system.

If a fixed on-off ratio is displayed, see Malfunction Table.
Malfunctions are indicated in ascending order of on-off ratio.

Malfunction Table On-off Ratio Test, Engine: at Idle

On–off Ratio %	Possible cause	Test step/Remedy [1]
0	Open circuit at socket 2 of 9-pole diagnostic socket (X11). Open circuit in wire to socket 3 or 6 of 9-pole diagnostic socket (X11) or on-off ratio tester defective. Mixture adjustment too rich.	Ground connection, Wiring, See DM, Engines Volume 1 – B 2 31 ⇒ 6
10	VAF sensor (B2) polarity reversed or defective. Terminals of WOT/CTP switch (S29/2) connector reversed or short circuit, WOT contact closed with insufficient air flow.	23 ⇒ 14.0 23 ⇒ 12.0 23 ⇒ 17.0
20	WOT contact defective or WOT/CTP switch (S29/2) polarity reversed. 20% indicated only if WOT/CTP switch (S29/2) is activated.	23 ⇒ 12.0

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

Malfunction Table **On-off Ratio Test, Engine: at Idle** (*continued*)

On–off Ratio %	Possible cause	Test step/Remedy [1]
30	Short or open circuit between CFI control module (N3) and 4-pole ECT sensor (B11/2), or 4-pole ECT sensor (B11/2) defective or greater deviation of temperature values as compared with DI control module (N1/3).	23 ⇒ 13.0
40	Wire to VAF sensor (B2) has open or short circuit, or VAF sensor (B2) defective.	23 ⇒ 14.0
50	O2S 1 (before TWC) (G3/2) not operational or defective, open circuit.	23 ⇒ 21.0
60	Vehicle speed signal at CFI control module (N3) implausible.	23 ⇒ 18.0
70	TNA-signal (rpm signal) at CFI control module (N3) implausible.	23 ⇒ 15.0
80	Data exchange DI control module (N1/3) ↔ CFI control module (N3) defective.	23 ⇒ 19.0
90	Current to electrohydraulic actuator (Y1) implausible.	23 ⇒ 10.0 – 11.0
95	Deceleration shut-off active.	23 ⇒ 37.0
100	Current or ground at CFI control module (N3) not present or CFI control module defective. On-off ratio tester defective. Mixture adjustment too lean. O2S 1 (before TWC) (G3/2) defective (short to circuit 31 [ground]).	23 ⇒ 1.0 – 3.0 See DM, Engines Volume 1 – B 2 31 ⇒ 6 23 ⇒ 21.0 – 22.0
Needle oscillates	No malfunction of signals monitored.	–

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

c) CFI Control Module (N3) DTC Readout

DTC	Possible cause	Test step/Remedy [1]
1	No malfunction in system.	–
2	WOT contact, WOT/CTP switch (S29/2) implausible.	23 ⇒ 12.0
3	ECT in CFI control module (N3) implausible.	23 ⇒ 13.0
4	VAF sensor (B2) potentiometer current implausible.	23 ⇒ 14.0
5	O2S 1 (before TWC) (G3/2) signal implausible	23 ⇒ 21.0 – 22.0
6	Not used.	–
7	TNA-signal (rpm signal) at CFI control module (N3) implausible.	23 ⇒ 15.0
8	Altitude correction signal from DI control module (N1/3) implausible.	See DI control module, section 5.1.
9	Current to electrohydraulic actuator (Y1) implausible.	23 ⇒ 10.0 – 11.0
10	CTP contact, WOT/CTP switch (S29/2) implausible.	23 ⇒ 17.0
11	Secondary air injection system implausible.	23 ⇒ 30.0
12	MAP values from DI control module (N1/3) implausible.	See DI control module, section 5.1.

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

c) CFI Control Module (N3) DTC Readout (*continued*)

DTC	Possible cause	Test step/Remedy [1]
13	IAT implausible.	23 ⇒ 20.0
14	Vehicle speed signal at CFI control module implausible.	23 ⇒ 18.0
15	Not used.	–
16	EGR switchover valve (Y27).	23 ⇒ 40.0
17	O2S 1 (before TWC) (G3/2) signal wire is shorted to positive or ground.	23 ⇒ 21.1 – 22.0
18	Current to ISC valve (Y6) implausible.	23 ⇒ 33.0
19	Not used.	–
20	Not used.	–
21	Not used.	–
22	O2S 1 (before TWC) heater voltage implausible.	23 ⇒ 22.3
23	Short to positive in purge control valve (Y58/1) circuit.	23 ⇒ 34.1
24	Not used.	–
25	Short to positive in start valve (Y8) circuit.	23 ⇒ 31.0 – 32.0

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

c) CFI Control Module (N3) DTC Readout (*continued*)

DTC	Possible cause	Test step/Remedy [1]
26	Short to positive in upshift delay solenoid valve (Y3/2) circuit.	23 ⇒ 44.0
27	Data exchange CFI control module (N3) ↔ DI control module (N1/3) defective.	23 ⇒ 19.0, Matching N3 ↔ N1/3.
28	Intermittent contact in ECT sensor (B11/2) circuit.	23 ⇒ 13.0
29	Difference in ECT between CFI control module (N3) and DI control module (N1/3)	23 ⇒ 13.0, See DI control module, section 5.1.
30	Not used.	–
31	Intermittent contact in IAT sensor (B17/2) circuit.	23 ⇒ 20.0
32	Not used.	–
33	Not used.	–
34	ECT from DI control module (N1/3) implausible.	See DI control module, section 5.1.

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

d) Engine Systems Control Module (N16) DTC Readout

DTC	Possible cause	Test step/Remedy [1]
1	No malfunction in system.	–
2	Fuel pump relay not functioning.	Replace engine systems control module (N16)
3	TD-signal interrupted (no longer implemented as of approx. 5/90 production).	23 ⇒ 16.0
4	Output for O2S 1 (before TWC) heater control defective.	23 ⇒ 22.0
5	Output for secondary air injection pump control defective.	23 ⇒ 30.0
6	Output for kickdown switch control defective.	Replace engine systems control module (N16)
7	Not used.	–
8	Not used.	–
9	Not used (implemented as of approx. 5/90 production for open circuit in O2S 1 (before TWC) heater	23 ⇒ 22.0
10	Not used.	–
11	A/C compressor engagement signal missing.	23 ⇒ 29.0
12	Output for A/C compressor control defective.	See DM, Climate Control, Volume 1.
13	A/C compressor slippage too great.	See DM, Climate Control, Volume 1.
14	Vehicle speed signal implausible.	23 ⇒ 18.0
15	Short circuit detected in fuel pump circuit.	23 ⇒ 8.0 – 9.0

[1] Observe Preparation for Test, see 22.

Diagnosis – Complaint Related Diagnostic Chart [2)]

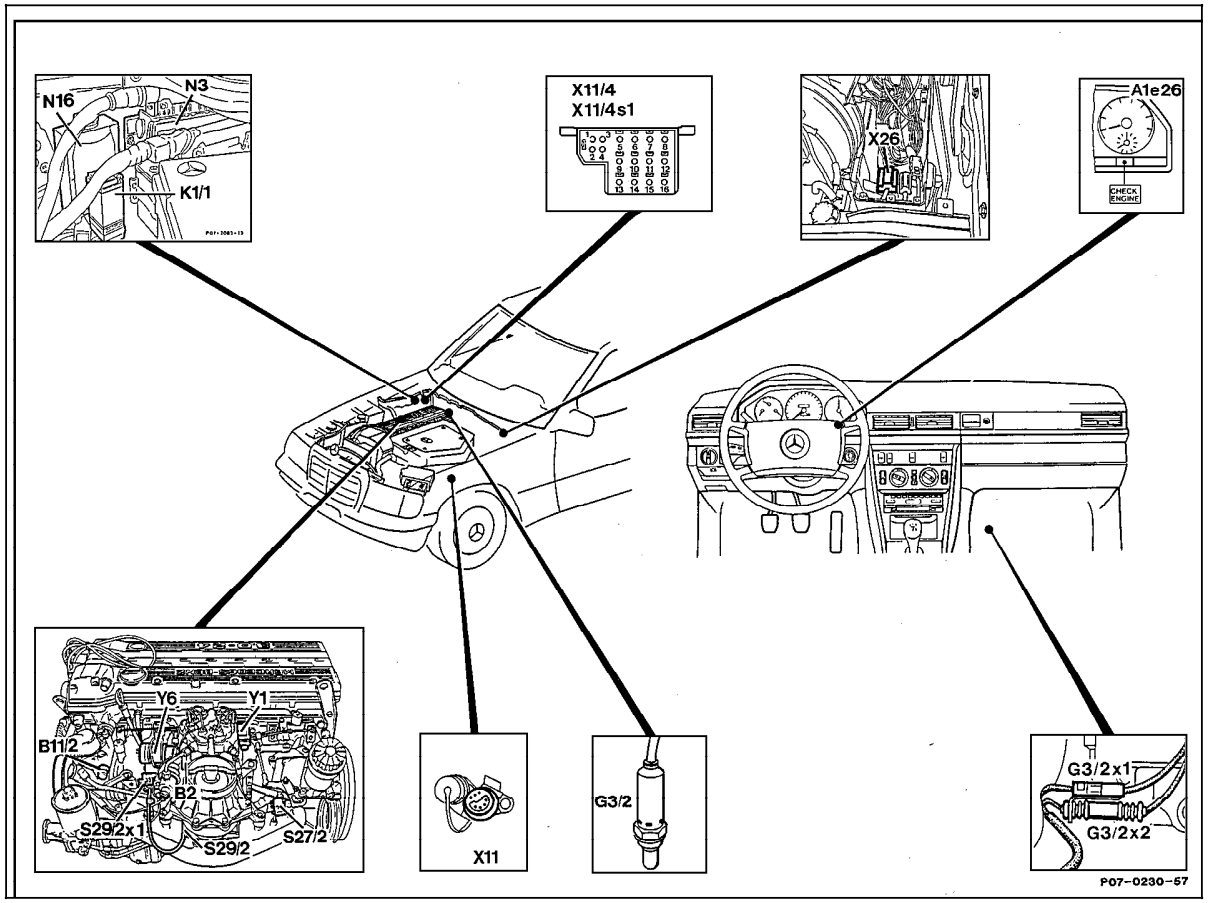
Complaint/Problem	Possible cause	Test step/Remedy [1)]
Engine does not start or starts poorly i.e. does not run.	Rest position of air flow sensor plate. ECT sensor. After-start enrichment. Fuel pressures.	Repair instructions 07.3 – 1612, 23 ⇒ 13.0, 34 ⇒ 2.0, 32 ⇒ 4.0
Engine is sluggish (poor transition)	VAF sensor position indicator. Fuel pressures. ECT sensor.	23 ⇒ 14.0, 32 ⇒ 4.0 23 ⇒ 13.0,
Insufficient engine output	Fuel pressures. WOT/CTP switch, full load/idle Mixture control (lambda)	32 ⇒ 4.0 26 ⇒ 12.0, See DM, Engines, Volume 1 – B 2 31 ⇒ 6

1) Observe Preparation for Test, see 22.

2) The following conditions must be met in order to use the Diagnostic Chart:
- The ignition system and the engine must be in proper operating condition,
- All electrical connectors must fit properly,
- Prescribed reference resistor must be installed.

Electrical Test Program – Component Locations

Engine 104
Model 124



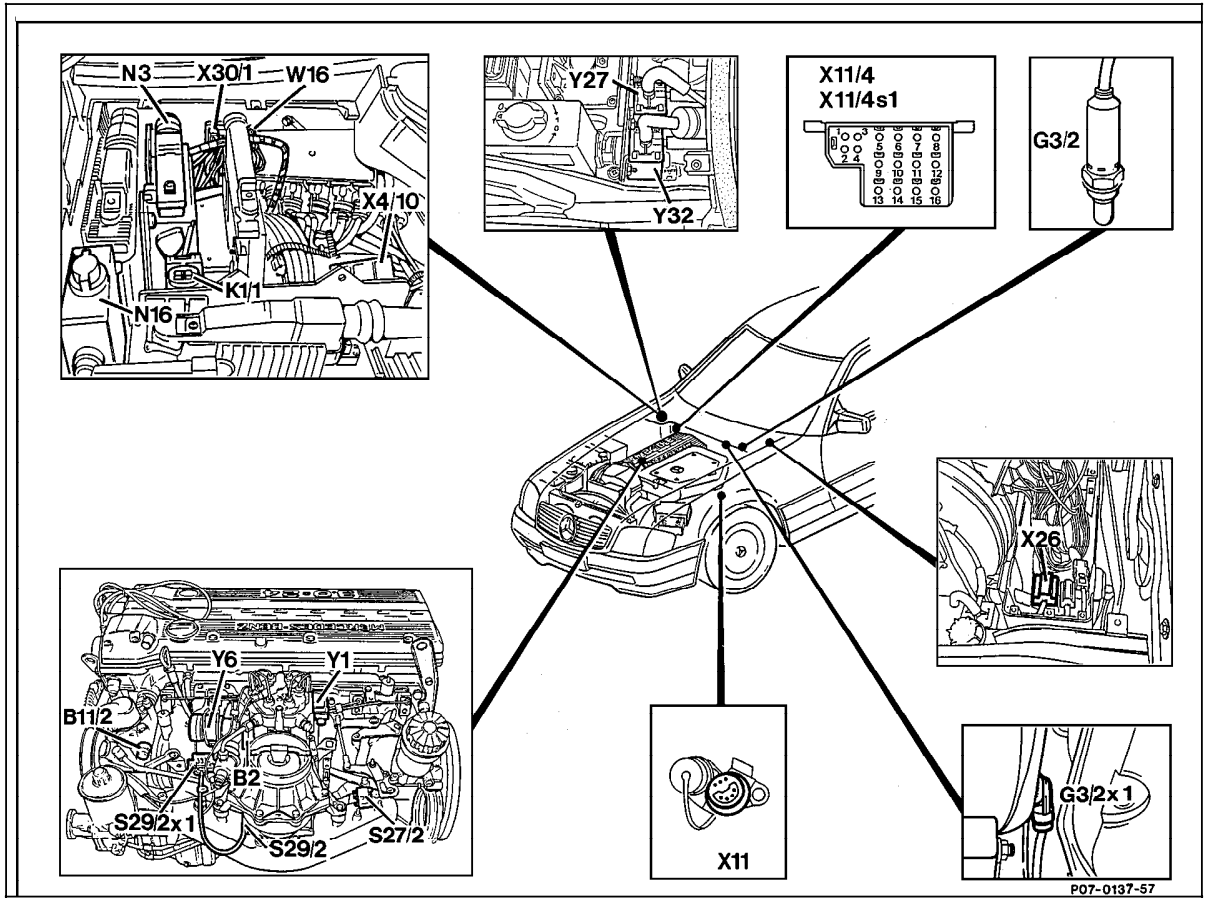
P07-0230-57

Figure 1

A1e26	"CHECK ENGINE" MIL
B2	VAF sensor
B11/2	ECT sensor (4-pole)
G3/2	O2S 1 (before TWC)
G3/2x1	O2S 1 connector (before TWC)
G3/2x2	O2S 1 signal connector
K1/1	Overvoltage protection relay module (87E, 7-pole)
N3	CFI control module
N16	Engine systems control module
S27/2	Deceleration shut-off microswitch
S29/2	WOT/CTP switch
S29/2x1	WOT/CTP switch connector
X11	Diagnostic socket (9-pole)
X11/4	Data link connector (DTC readout)
X11/4s1	Pushbutton switch (with LED) (USA) – California
X26	Interior/engine connector (12-pole)
Y1	Electrohydraulic actuator (EHA)
Y6	ISC valve

Electrical Test Program – Component Locations

Engine 104
Model 129



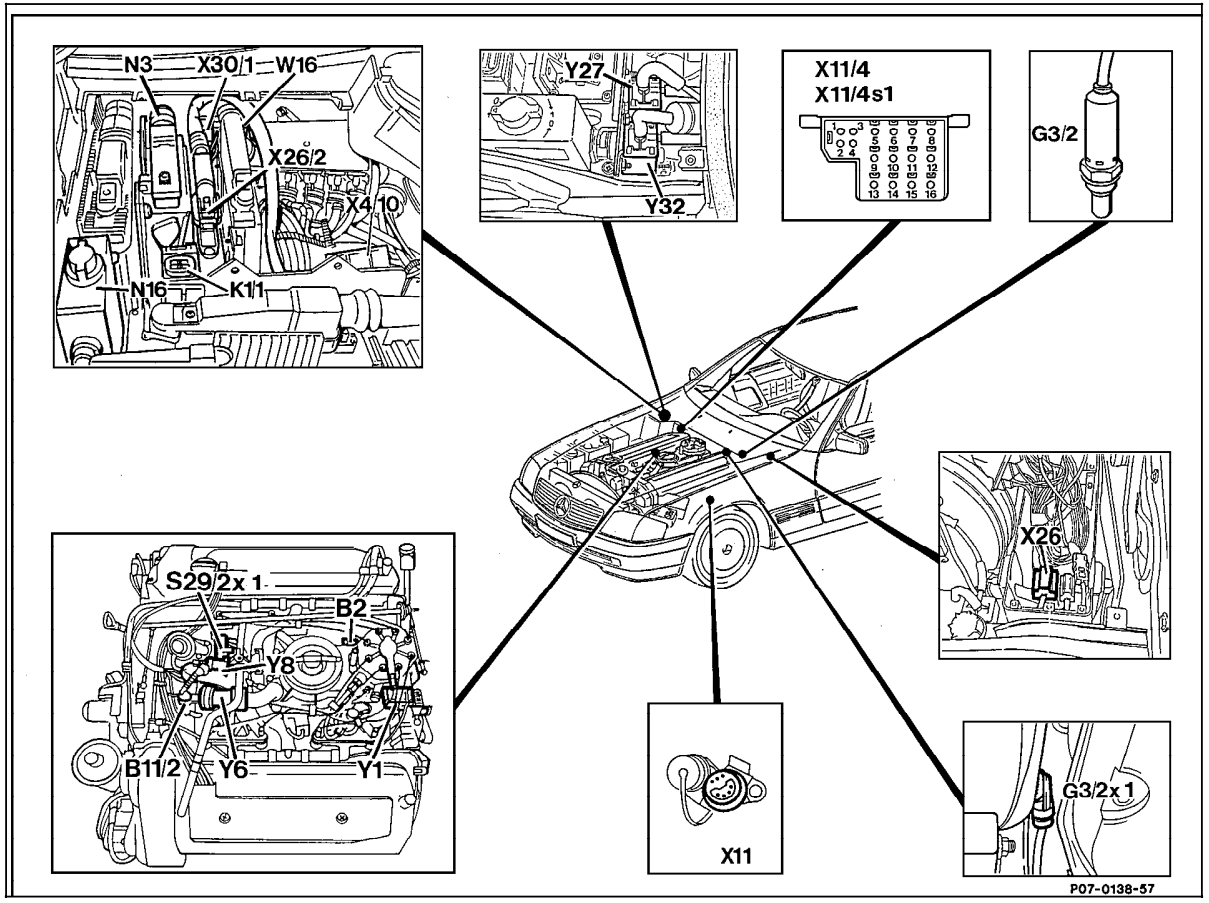
P07-0137-57

Figure 2

B2	VAF sensor
B11/2	ECT sensor (4-pole)
G3/2	O2S 1 (before TWC)
G3/2x1	O2S 1 connector (before TWC)
K1/1	Overvoltage protection relay module (87E, 7-pole)
N3	CFI control module
N16	Engine systems control module
S27/2	Deceleration shut-off microswitch
S29/2	WOT/CTP switch
S29/2x1	WOT/CTP switch connector
X11	Diagnostic socket (9-pole)
X11/4	Data link connector (DTC readout)
X11/4s1	Pushbutton switch (with LED) (USA) – California
X26	Interior/engine connector (12-pole)
X30/1	Multi-function connector block
Y1	Electrohydraulic actuator (EHA)
Y6	ISC valve
Y27	EGR switchover valve
Y32	AIR pump switchover valve

Electrical Test Program – Component Locations

Engine 119
Model 129



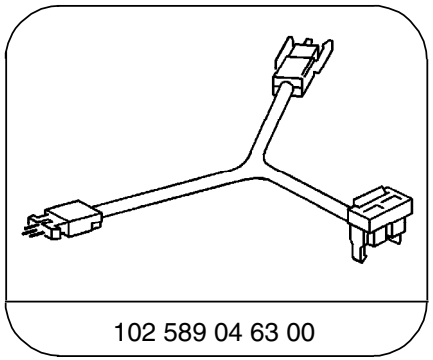
P07-0138-57

Figure 3

B2	VAF sensor
B11/2	ECT sensor (4-pole)
G3/2	O2S 1 (before TWC)
G3/2x1	O2S 1 connector (before TWC)
K1/1	Overvoltage protection relay module (87E, 7-pole)
N3	CFI control module
N16	Engine systems control module
S29/2x1	WOT/CTP switch connector
W16	Ground (component compartment)
X4/10	Terminal block (circuit 30/30Ü/61e/87L) (6-pole)
X11	Diagnostic socket (9-pole)
X11/4	Data link connector (DTC readout)
X11/4s1	Pushbutton switch (with LED) (USA) – California
X26	Interior/engine connector (12-pole)
X26/2	Engine separation point connector
X30/1	Multi-function connector block
Y1	Electrohydraulic actuator (EHA)
Y6	ISC valve
Y8	Start valve
Y27	EGR switchover valve
Y32	AIR pump switchover valve

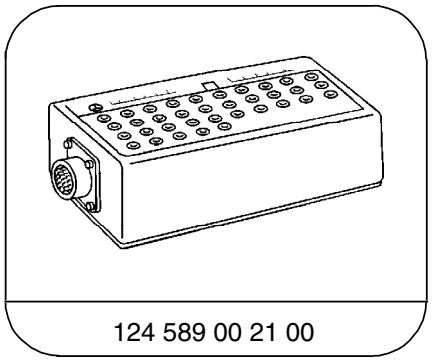
Electrical Test Program – Preparation for Test

Special Tools



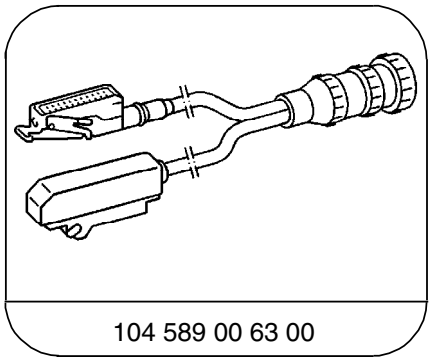
102 589 04 63 00

Test cable



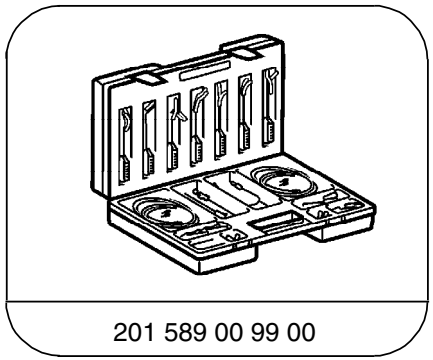
124 589 00 21 00

35-pin socket box



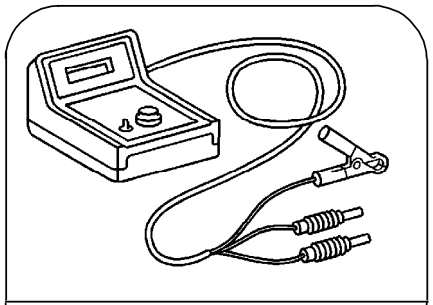
104 589 00 63 00

Test cable



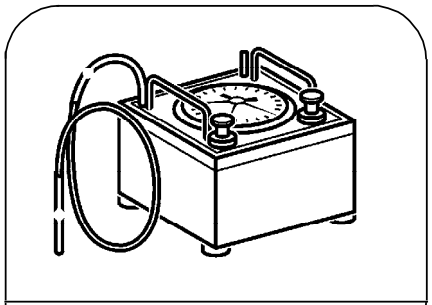
201 589 00 99 00

Electrical connecting set



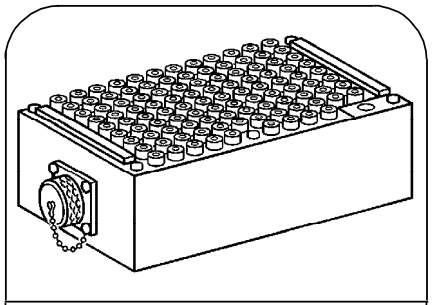
124 589 19 21 00

Pulse counter



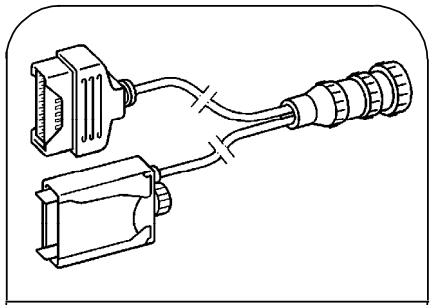
201 589 13 21 00

Tester



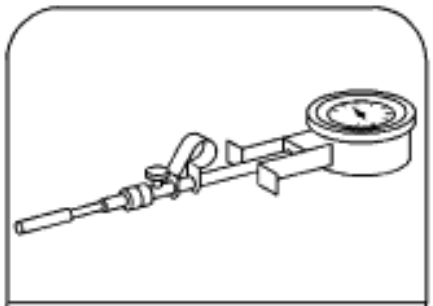
129 589 00 21 00

126-pin socket box



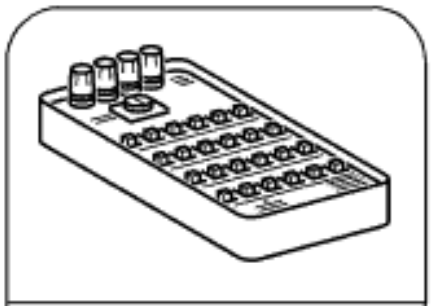
129 589 05 63 00

22-pin test cable



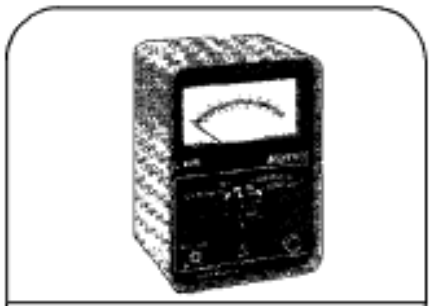
124 589 07 21 00

Remote thermometer



124 589 09 63 00

Ohm decade



909 589 09 21 00

On-Off Ratio Tester

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 (Model 40-960) Sun MEA-1500MB

1) Available through the MBUSA Standard Equipment Program.

Connection diagrams, see section 0.

Electrical wiring diagrams, see Electrical Troubleshooting Manual.

⚠

The preliminary test "Engine Test, Adjustment" must be performed prior to any testing in the Diagnostic Manual (see DM, Engines, Volume 1, section B).

DTC or On-off Ratio Readout

CFI control module: If there is no display when performing the DTC readout, then test steps 1.0 to 3.0 and 10.0 must be performed.

Engine systems control module: If there is no display when performing the DTC readout, then test steps 4.0 to 7.0 must be performed.

Electrical Test Program – Preparation for Test

Connector Layout – CFI Control Module (N3)

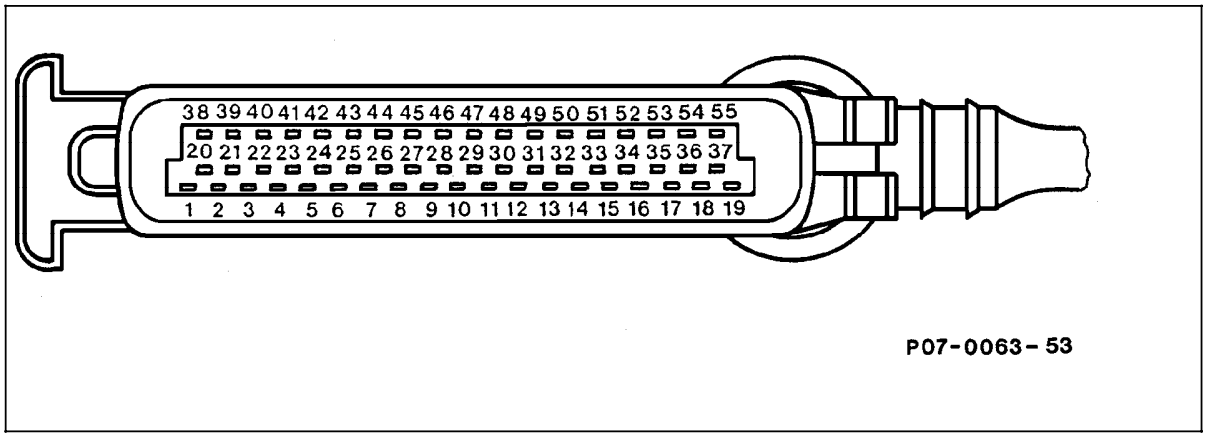


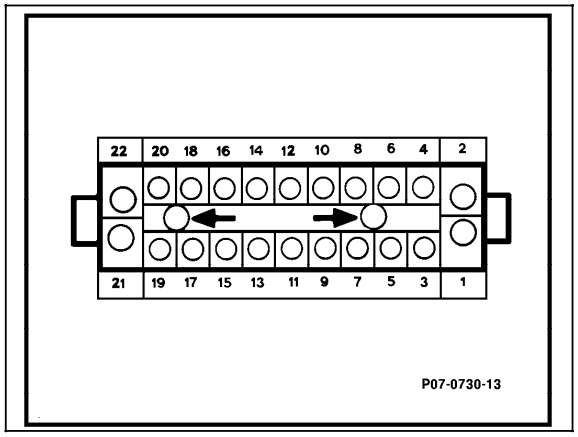
Figure 1

P07-0063-53

1E	Voltage supply, circuit 30a	21	–	41E	Voltage supply, components
2A	Purge control valve	22A	Right adjustable camshaft timing solenoid (Y49/2)	42	Control signal, secondary air injection pump
3A	Control signal, O2S 1 heater	23A	ISC valve (–)	43	–
4A	ISC valve (+)	24	"CHECK ENGINE" MIL	44	–
5E	IAT sensor (ground)	25	–	45E	A/C compressor engagement signal
6E	Ground W16	26E	Data exchange with N1/3	46E	WOT/CTP switch, WOT
7A	DTC readout memory	27E	RPM signal (TNA)	47E	WOT/CTP switch, CTP
8A	Fuel consumption signal	28E	Ignition/starter switch, circuit 50	48	–
9E	Voltage supply, components	29E	Vehicle speed signal	49	–
10	–	30A	Lambda output, on-off ratio to X11	50	–
11E	Starter engagement signal, circuit 50	31A	VAF sensor, socket 3	51	–
12	–	32A	O2S 1 wire shielding	52E	VAF sensor, socket 2
13E	O2S 1 signal	33	–	53	–
14E	IAT sensor signal	34E	VAF sensor, socket 1	54	–
15	–	35A	Ground, ECT sensor (B11/2), socket 4	55E	Electrohydraulic actuator (–)
16E	ECT sensor (B11/2), socket 2	36	–		
17	–	37A	Electrohydraulic actuator (+)		
18E	Diagnostic signal, O2S 1 heater	38A	EGR switchover valve (Y27)	**A**	**Output signal**
19E	Ground W11 (electronics)	39A	Transmission shift point control	**E**	**Input signal**
20A	Start valve control	40A	Left adjustable camshaft solenoid (Y49/1)		

Electrical Test Program – Preparation for Test

Connector Layout – Engine Systems Control Module



P07-0730-13

Figure 2

1E	Voltage supply, circuit 30
2A	Fuel pump relay
3E	A/C compressor control signal
4E	Circuit 31, ground
5E	RPM signal (+) for A/C compressor
6E	RPM signal (–) for A/C compressor
7E	Kickdown shut-off
8A	Diagnostic signal, O2S 1 heater
9A	A/C compressor engagement signal
10E	Voltage supply, circuit 15 unfused (ignition)
11A	TNA-signal (engine rpm)
12E	Starter signal
13E	Engine 104: Not used Engine 119: Vehicle speed signal
14A	Diagnostics – DTC readout
15	Not used
16E	TN-signal from DI control module
17E	Secondary air injection pump – input
18E	O2S 1 heater – input
19A	Secondary air injection pump – output
20A	O2S 1 heater – output
21E	Voltage supply, circuit 15 fused (ignition)
22A	A/C compressor clutch – output

A	**Output signal**
E	**Input signal**
Arrow	**Safety lock**

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
1.0 [1]		**Ground, engine (W11)** (connection point for ground wires) **Model 124**	N3 19 — V — cir. 30	–	11 – 14 V	Wiring, Ground connection W11 (Figure 21) loose.
		Model 129	N3 X4/10 19 — V — cir. 30	–	11 – 14 V	Wiring, Ground connection W11 (Figure 21) loose.
1.1		Ground, battery (W10) **Model 124**	N3 6 — V — cir. 30	–	11 – 14 V	Wiring, Ground connection W10 (Figure 20) loose.
		Ground, component compartment (W16) **Model 129**	N3 X4/10 6 — V — cir. 30	–	11 – 14 V	Wiring, Ground connection W16 (Figure 23) loose.

[1] On-off ratio 100% when measured with on-off ratio tester.

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
2.0 [1]		**CFI control module (N3)** Voltage supply, Circuit 30a	N3 19 — V — 1	–	11 – 14 V	Wiring, Overvoltage protection relay module (K1/1) fuse, K1/1.
2.1		Wiring from N3 to K1/1	N3 1 — Ω — K1/1 4	CFI control module (N3) unplugged.	< 1 Ω	Wiring.
2.2		Wiring from circuit 30 to K1/1	N3 6 — V — K1/1 1	–	11 – 14 V	Wiring.
2.3		Wiring from circuit 30 to K1/1	X4/10 cir. 30 — Ω — K1/1 1	–	< 1 Ω	Wiring.
3.0 [1]		**CFI control module (N3)** Voltage supply, Circuit 87E	N3 19 — V — 41	Ignition: **ON** Overvoltage protection relay module (K1/1) plugged in.	11 – 14 V	Wiring, Connected components are shorted to circuit 31 (ground).

[1] On-off ratio 100% when measured with on-off ratio tester.

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
4.0		**Engine systems control module (N16)** Ground	N16 4 — V — X4/10 cir. 30	–	11 – 14 V	Wiring, Loose ground connection: Model 124: W10 (Figure 20) Model 129: W16 (Figure 23).
5.0		**Engine systems control module (N16)** Voltage supply Circuit 30	N16 4 — V — 1	–	11 – 14 V	Wiring, Loose wire at terminal block, terminal 30/61 (battery) (X4/10): Model 124: (Figure 25) Model 129: (Figure 26)
6.0		**Engine systems control module (N16)** Voltage supply Circuit 15 unfused	N16 4 — V — 10	Ignition: **ON**	11 – 14 V	Wiring, Loose wire at fuse and relay box (F1), plug connection: Model 124: Interior/engine connector (X26) (Figure 30) Model 129: Multi-function connector block (X30/1) (Figure 31).
7.0		**Engine systems control module (N16)** Voltage supply Circuit 15	N16 4 — V — 21	Ignition: **ON**	11 – 14 V	Wiring, Loose wire at fuse and relay box (F1), plug connection: Model 124: Interior/engine connector (X26) (Figure 30) Model 129: Multi-function connector block (X30/1) (Figure 31).

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
8.0		**Fuel pumps (M3m1, M3m2)** Operation	N16 4 — (V) — 21	Ignition: **OFF** Engine systems control module (N16) unplugged. Ignition: **ON**	11 – 14 V	Wiring, FP harness connector (X36): Model 124: (Figure 32) Model 129: (Figure 33) M3m1 or M3m2.
9.0		**Fuel pumps (M3m1, M3m2)** Control	N16 4 — (V) — 2	N16 plugged in. Connector 2 of DI control module unplugged (Figure 7). Engine: **Crank**	10 ± 2V while cranking	⇒ 9.1, N16.
9.1		Control signal, Circuit 50	N16 4 — (V) — 12	Connector 2 of DI control module unplugged (Figure 7). Engine: **Crank**	10 ± 2V while cranking	Wiring, Model 124: Interior/engine connector (X26) (Figure 30) defective, Model 129: AT/engine connector(X22/2) (Figure 29) defective.

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
10.0	1)	**Electrohydraulic actuator (Y1)** Current check	Y1 1 — (A) — 2	Connect test cable 102 589 04 63 00 to Y1. Ignition: **ON**	**Engine 104:** 20 mA **Engine 119:** 75 mA	Wiring to CFI control module (N3), Y1.
11.0 1)		**Electrohydraulic actuator (Y1)** Malfunction circuit	N3 55 — (Ω) — 37	Ignition: **OFF** Unplug N3	19.5 ± 1 Ω	Wiring, Y1.
11.1		Resistance	Y1 1 — (Ω) — 2	Ignition: **OFF** Y1 unplugged	19.5 ± 1 Ω	Y1.
11.2		Wiring	N3 37 — (Ω) — Y1: 1 55 — (Ω) — Y1: 2	Ignition: **OFF** N3 and Y1 unplugged.	< 1 Ω	Wiring, Wires in connector (Y1) reversed.

1) On-off ratio 90% when measured with on-off ratio tester.

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
12.0	1) 2)	**WOT/CTP switch (S29/2)** Malfunction circuit – WOT contact	N3 19 — Ω — 46	Ignition: OFF Unplug CFI control module (N3) connector and connector "B" (Figure 7) of DI control module (N1/3). Ignition: ON (ASR only) Accelerator pedal in CTP Disconnect AT control pressure cable on vehicles without ASR. Accelerator pedal in WOT position.	 ∞ Ω < 1 Ω	Wiring, WOT contact, S29/2, Polarity reversed at connector S29/2x1: Engine 104: (Figure 18), Engine 119: (Figure 19).
12.1		WOT contact	S29/2x1 2 — Ω — 3	Ignition: ON (ASR only) Connector (S29/2x1) unplugged: Engine 104: (Figure 18) Engine 119: (Figure 19) Accelerator pedal in CTP Accelerator pedal in WOT position.	 ∞ Ω < 1 Ω	Adjust or replace S29/2.

1) On-off ratio 20% when measured with on-off ratio tester.

2) On-off ratio 10% when measured with on-off ratio tester.

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
12.2		Wiring	N3 46 — S29/2x1 3	Ignition: **OFF** CFI control module (N3) unplugged.	< 1 Ω	Wiring.
12.3		Wiring	W11 S29/2x1 2	Ignition: **OFF**	< 1 Ω	Wiring, Ground connection (W11) loose (Figure 21).

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
13.0	3 28 29 [1]	**ECT sensor (B11/2)** Malfunction circuit	N3 35 — (V) — 16	Ignition: **ON**	See Table I	Wiring, B11/2, CFI control module (N3).
13.1		B11/2	B11/2 1 — (Ω) — 3 B11/2 2 — (Ω) — 4	B11/2 connector unplugged. Measure connections diagonally and compare both values (Figure 12).	See Table I (both values must be the same).	B11/2.
13.2		Wiring	N3 B11/2 16 — (Ω) — 2 35 — (Ω) — 4	Ignition: OFF N3 connector unplugged. Terminal layout of connector (B11/2, Figure 12).	< 1 Ω	Wiring.

[1] On-off ratio 30% when measured with on-off ratio tester.

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
14.0	Ч 1) 2)	**VAF sensor (B2)** Malfunction circuit	N3 34 — (V) — 31	Engine: **at Idle** and at operating temperature.	4.6 –5.1 V	B2, CFI control module (N3),
			N3 34 — (V) — 52		0. 55 – 0.95 V	Wiring, N3 B2.
14.1		B2	B2 1 — (Ω) — 3	Ignition: **OFF** Connector on B2 unplugged.	3.6 – 4.4 kΩ	B2.
14.2		B2	B2 1 — (Ω) — 2	Slowly deflect air flow sensor plate by hand.	Ω-value increases continuously up to 2/3 of travel, then decreases again.	B2.
14.3		Wiring	N3 B2 34 — (Ω) — 1 52 — (Ω) — 2 31 — (Ω) — 3	Ignition: **OFF** N3 connector unplugged.	< 1 Ω	Wiring.

1) On-off ratio 40% when measured with on-off ratio tester.
2) On-off ratio 10% when measured with on-off ratio tester.

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
15.0	1)	**TN-signal**	N3 19 — (V) — 27	Engine: **at Idle**	5 – 7 V	Wiring, ⇒ 16.2, TN-signal implausible, other connected components defective.
15.1		Wiring	N3 — N16 27 — (Ω) — 11	Ignition: **OFF**	< 1 Ω	Wiring.
16.0		**TN-signal**	N16 4 — (V) — 16	Engine: **at Idle**	5 – 7 V	Wiring, DI control module (N1/3).
16.1		TN-signal wire	N16 N1/3 4 — (Ω) — 16 (A)	Ignition: **OFF** Connector (A) of N1/3 unplugged (Figure 7).	< 1 Ω	Wiring.
16.2		Engine systems control module (N16)	N16 4 — (V) — 11	Ignition: **OFF** Connector (A) of N1/3 connected. Engine: **at Idle**	5 – 7 V	N16.

1) On-off ratio 70% when measured with on-off ratio tester.

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
17.0	10 [1]	**WOT/CTP switch (S29/2)** Malfunction circuit – CTP contact	N3 19 — Ω — 47	Ignition: **OFF** CFI control module (N3) unplugged. Accelerator pedal in CTP Depress accelerator pedal	 < 1 Ω ∞ Ω	Wiring, CTP contact.
17.1	22	CTP contact	S29/2x1 1 — Ω — 2	Ignition: **OFF** Connector (S29/2x1) unplugged. Engine 104: (Figure 18) Engine 119: (Figure 19) Accelerator pedal in CTP Accelerator pedal in WOT position	 < 1 Ω ∞ Ω	Adjust or replace S29/2.
17.2		Wiring	N3 47 — Ω — S29/2x1 1	Ignition: **OFF** N3 unplugged.	< 1 Ω	Wiring.

[1] On-off ratio 10% when measured with on-off ratio tester.

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
17.3		Wiring	W11 — Ω — S29/2x1 — 2	Ignition: **OFF** Connector (S29/2x1) unplugged.	< 1 Ω	Wiring, Ground connection (W11) loose (Figure 21).
18.0	14 [1]	**Vehicle speed signal**	N3 19 — V — 29	Ignition: **OFF** ASR control module (N30/1) connector unplugged. Engine: **Start** Drive vehicle onto chassis dynamometer, “drive” vehicle at > 20 km/h (> 13 mph). **Model 124:** Ignition: ON Roll vehicle approx. 1 meter.	< 1 V Needle oscillates: 0 – 12 V (0 – 9 V with consumers)	Wiring, Model 124: Hall-effect speed sensor (B6), Model 129: Electronic speedometer (A1p8).
18.1		Wiring **Model 124**	N3 19 — Ω — X53/5	Ignition: **OFF** CFI control module (N3) and Hall-effect sensor multipoint connector (X53/5) unplugged.	< 1 Ω	Wiring, Hall-effect speed sensor (B6).

[1] On-off ratio 60% when measured with on-off ratio tester.

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
[18.1]		**Model 129**	N3 29 — X30/1 3 (A2)	Ignition: **OFF** CFI control module (N3) and connector A2 of multi-function connector block (X30/1) (Figure 31) unplugged.	< 1 Ω	Wiring, Check X30/1 (Figure 31).
18.2		Wiring **Model 129**	X30/1 3 (A2) — A1p8 1 (1)	Ignition: **OFF** Connector (1) of A1p8 unplugged.	< 1 Ω	Wiring, Check A1p8, see DM, body and accessories, Vol. 1 – 1.2.
19.0	27 [1)]	**Data line** CFI control module (N3) ↔ DI control module (N1/3)	N3 26 — N1/3 7 (A)	Ignition: **OFF** Connector (A) of N1/3 unplugged (Figure 7).	< 1 Ω	Wiring, Check for correct part no. matching of control modules N3 and N1/3.
20.0	13 31	**IAT sensor (B17/2)** Malfunction circuit	N3 5 — 14	Ignition: **ON**	See Table I	Wiring, Engine 104: (Figure 1), Engine 119: (Figure 2), B17/2, N3.

1) On-off ratio 80% when measured with on-off ratio tester.

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
20.1		Resistance	B17/2 2 — Ω — 3	Ignition: **OFF** Connector of B17/2 unplugged.	See Table **I**	B17/2.
20.2		Wiring	N3 / B17/2 5 — Ω — 2 14 — Ω — 3	Ignition: **OFF** CFI control module (N3) and B17/2 unplugged.	< 1 Ω	Wiring.
21.0	5 [1]	**O2S 1 (beforeTWC) (G3/2)** Malfunction circuit	N3 19 — V — 13	Engine: at Idle and at operating temperature.	Oscillates between 0.1 – 0.9 V	Wiring, G3/2, N3, ⇒ 35.0 Check mixture adjustment.
21.1	17	Insulation, O2S 1 wire	N3 32 — Ω — 5 13	Ignition: **OFF** N3 connector and O2S 1 signal connector (G3/2x2) orO2S 1 connector (G3/2x1) unplugged. Model 124: (Figure 13) Model 129: (Figure 14).	∞ Ω	Wiring.

[1] On-off ratio 50% when measured with on-off ratio tester.

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
21.2		O2S 1 wire [1] Model 124	N3 13 — Ω — G3/2x2	Ignition: **OFF** CFI control module (N3) and O2S 1 signal connector (G3/2x2) unplugged.	< 1 Ω	Wiring,
		Model 129	N3 13 — Ω — G3/2x1 3	Ignition: **OFF** CFI control module (N3) and O2S 1 connector (G3/2x1) unplugged.	< 1 Ω	Wiring.
21.3		O2S 1 (before TWC) (G3/2)	N3 13 — 2 V	On-off ratio tester connected. Engine: **at Idle** Connector G3/2x1 connected.	0 – 10% at on-off ratio tester after 30 seconds.	G3/2.
21.4		CFI control module (N3)	N3 13 — 6	On-off ratio tester connected. Engine: **at Idle** Connector G3/2x1 unplugged.	90 – 100% at on-off ratio tester after 30 seconds.	N3.
22.0		O2S 1 heater Voltage supply	N16 4 — V — 20	Engine: **at Idle**	11 – 14 V	Wiring, N3, Engine systems control module (N16).

[1] Drive vehicle onto lift.

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
22.1		Control signal O2S 1 heater	N16 4 — (–) V (+) — 18	Engine: **at Idle**	11 – 14 V	Wiring, CFI control module (N3).
22.2		Wiring	N3 — N16 3 — (–) Ω (+) — 18	Ignition: **OFF** N3 and engine systems control module (N16) unplugged.	< 1 Ω	Wiring.
22.3	22	Control signal O2S 1 heater	N16 20 — (–) A (+) — 1	Ignition: **OFF** N16 unplugged. O2S 1 connector (G3/2x1) connected. Model 124: (Figure 13) Model 129: (Figure 14).	0.5 – 1.7 A	Wiring, O2S 1 (before TWC) (G3/2).
22.4		**Model 124** Wiring	G3/2x1 — N16 2 — (–) Ω (+) — 20	Ignition: **OFF** N16 and G3/2x1 unplugged.	< 1 Ω	Wiring.

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
[22.4]		**Model 129** Wiring [1]	G3/2x1 2 — Ω — N16 — 20	N16 and G3/2x1 unplugged.	< 1 Ω	Wiring.
22.5		Model 124 Wiring	G3/2x1 1 — Ω — W10	Ignition: **OFF** O2S 1 heater coil connector (G3/2x1) unplugged.	< 1 Ω	Wiring,
		Model 129 Wiring [1]	G3/2x1 1 — Ω — W16	Ignition: **OFF** Connector G3/2x1 unplugged.	< 1 Ω	Wiring.
23.0		**Adjustable camshaft timing solenoid (Y49) and mechanical camshaft adjustment** **Engine 104**	N3 Y49 1 — 2 N3 Y49 6 — 1	Ignition: **OFF** Connector on Y49 unplugged. Engine: **at Idle** Bridge for a max. of 10 seconds.	Engine shakes	Y49, Check mechanical camshaft adjustment (see SMS, Repair Instructions, Engine 104, Group 05, Job No. 217).

[1] Drive vehicle onto lift.

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
24.0		**Engine 104** Camshaft adjustment (electrical) (Y49)	Y49 1 — (-) (A) (+) — 2	Ignition: **OFF** Connect test cable 102 589 04 63 00 to adjustable camshaft timing solenoid (Y49). Engine: **Start** Increase engine speed to approx. 2000 rpm.	Briefly 1.5 A, then 1 A	Wiring, Y49, CFI control module (N3).
25.0		**Engine 119** Left adjustable camshaft timing solenoid (Y49/1) and left mechanical camshaft timing adjustment	N3 — Y49/1 1 — 2 N3 — Y49/1 6 — 1	Ignition: **OFF** Connector on Y49/1 unplugged. Engine: **at Idle** ⚠ Bridge for a max. of 10 seconds.	Engine shakes	Y49/1, Check mechanical camshaft adjustment (see SMS, Repair Instructions, Engine 119, Group 05, Job No. 217).
26.0		**Engine 119** Left camshaft adjustment (electrical) (Y49/1)	Y49/1 1 — (-) (A) (+) — 2	Ignition: **OFF** Connect test cable 102 589 04 63 00 to adjustable camshaft timing solenoid (Y49/1). Engine: **Start** Increase engine speed to approx. 3000 rpm.	Briefly 1.5 A, then 1 A	Wiring, Y49/1, Chech contacts at engine separation point connector (X26/2), CFI control module (N3).

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
26.1		Left camshaft adjustment Control	N3 40 — (V) — 41	Increase engine speed to approx. 3000 rpm.	Briefly 7.5 V then approx. 5 V	If nominal value is greater than 11 V, check CFI control module (N3) wiring for open circuit, ⇒ 26.2.
26.2		Left adjustable camshaft timing solenoid (Y49/1)	Y49/1 1 — (Ω) — 2	Ignition: **OFF** Connector on Y49/1 unplugged.	5 ± 1 Ω	Y49/1.
26.3		Wiring	N3 41 — (Ω) — Y49/1 2 40 — (Ω) — 1	Ignition: **OFF** CFI control module (N3) and connector on Y49/1 unplugged.	< 1 Ω	Wiring

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
27.0		**Engine 119** Right adjustable camshaft timing solenoid (Y49/2) and right mechanical camshaft adjustment	N3 Y49/2 1 — 2 N3 Y49/2 6 — 1	Ignition: **OFF** Connector on Y49/2 unplugged. Engine: **at Idle** ⚠ Bridge for a max. of 10 seconds.	Engine shakes	Y49/2, Check mechanical camshaft adjustment (see SMS, Repair Instructions, Engine 119, Group 05, Job No. 217).
28.0		Right camshaft adjustment (electrical) (Y49/2)	Y49/2 1 — A — 2	Ignition: **OFF** Connect test cable 102 589 04 63 00 to adjustable camshaft timing solenoid (Y49/2). Engine: **Start** Increase engine speed to approx. 3000 rpm.	Briefly 1.5 A, then 1 A	Wiring, Y49/2, CFI control module (N3).
28.1		Right camshaft adjustment Control	N3 22 — V — 41	Increase engine speed to approx. 3000 rpm.	Briefly 7.5 V then approx. 5 V	Wiring, Y49/2, N3.
28.2		Right adjustable camshaft timing solenoid (Y49/2)	Y49/2 1 — Ω — 2	Ignition: **OFF** Connector on Y49/2 unplugged.	5 ± 1 Ω	Y49/2.

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
28.3		Wiring	N3 — Y49/2 41 — Ω — 2 22 — Ω — 1	Ignition: **OFF** CFI control module (N3) and connector on Y49/2 unplugged.	< 1 Ω	Wiring.
29.0		**A/C compressor engagement signal**	N3 6 — V — 45	Engine: **at Idle** Switch **ON** automatic climate control (A/C compressor).	5 – 10 V	Wiring, Engine systems control module (N16), Check A/C compressor cut-out (see DM, Climate Control, Vol. 1).
29.1		Wiring	N16 — N3 9 — Ω — 45	Ignition: **OFF** N3 and A/C compressor control module (N6) unplugged.	< 1 Ω	Wiring.

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
30.0		**Electromagnetic AIR pump clutch (Y33)** Control	N16 4 — ◄ V ► — 19	Ignition: **OFF** ECT sensor (B11/2) unplugged. Using two resistance substitution units, simulate 2.5 kΩ resistance (+ 20°C) at sockets 2 and 4 as well as at sockets 1 and 3 (Figure 12). Engine: **at Idle** Disconnect air hose to check valve.	11 – 14 V (for approx. 2 minutes after start) Noticeable air flow at air hose.	⇒ 30.1, Engine systems control module (N16).
30.1		Secondary air injection control signal	N16 17 — ◄ V ► — 21	Ignition: **OFF** ECT sensor (B11/2) unplugged. Simulate 2.5 kΩ resistance (+ 20°C) at sockets 2 and 4 as well as at sockets 1 and 3 (Figure 12). Engine: **at Idle**	11 – 14 V (for approx. 2 minutes after start)	Wiring, CFI control module (N3).
30.2		Wiring	N3 N16 42 — ◄ Ω ► — 17	Ignition: **OFF** N3 and N16 unplugged.	< 1 Ω	Wiring.

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
30.3		AIR pump switchover valve (Y32) Control	Y32 1 — ◄ –Ⓥ+ ► — 2	Ignition: **OFF** ECT sensor (B11/2) unplugged. Simulate 2.5 kΩ resistance (+ 20°C) at sockets 2 and 4 as well as at sockets 1 and 3 (Figure 12). Connector on Y32 unplugged. Engine: **at Idle**	11 – 14 V (for approx. 2 minutes after start)	Wiring to Y32 (located in engine compartment): Model 124: (Figure 5), Model 129: (Figure 6).
30.4		AIR pump switchover valve (Y32)	Y32 1 — ▬ –Ⓞ+ ► — 2	Ignition: **OFF** Connector on Y32 unplugged.	25 ± 5 Ω	Y32.
30.5		Electromagnetic AIR pump clutch (Y33) Control	Y33 1 — ◄ –Ⓥ+ ► — 2	Ignition: **OFF** ECT sensor (B11/2) unplugged. Simulate 2.5 kΩ resistance (+ 20°C) at sockets 2 and 4 as well as at sockets 1 and 3 (Figure 12). Connector on Y33 unplugged. Engine: **at Idle**	11 – 14 V (for approx. 2 minutes after start)	Wiring to Y33 (located in harness channel in front of right spring tower).
30.6		Electromagnetic AIR pump clutch (Y33)	Y33 1 — ▬ –Ⓞ+ ► — 2	Connector on Y32 unplugged.	5 ± 1 Ω	Y33.

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
31.0	25	**Start valve (Y8)** Control	N3 20 — (V) — 41	Ignition: **OFF** ECT sensor (B11/2) unplugged. Using two resistance substitution units, simulate 2.5 kΩ resistance (+ 20°C) at sockets 2 and 4 as well as at sockets 1 and 3 (Figure 12). Engine: **at Idle**	Briefly 10 ± 2 V	CFI control module (N3), see "Testing Starting System" (33), ⇒ 32.0.
32.0		Start valve (Y8) Resistance	Y8 1 — (Ω) — 2	Ignition: **OFF** Connector on Y8 unplugged.	10 – 15 Ω	Y8.
32.1		Wiring	N3 — Y8 20 — (Ω) — 1 41 — (Ω) — 2	Ignition: **OFF**	< 1 Ω	Wiring, Intermittent contact (X26/2).

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
33.0		**ISC valve (Y6)** Current check	Y6 1 — (–) A (+) — 2	Ignition: **OFF** Connect test cable to Y6. Engine: **at Idle**	**Engine 104** 600 ± 50 mA **Engine 119** 700 – 1000 mA	Wiring, Intermittent contact (X26/2), CFI control module (N3).
33.1		Resistance	Y6 1 — (–) Ω (+) — 2	Ignition: **OFF**	**Engine 104** 7.5 – 10 Ω **Engine 119** 3.5 – 5.5 Ω	Y6, Intermittent contact (X26/2).
33.2		Wiring	N3 Y6 23 — (–) Ω (+) — 1 4 — (–) Ω (+) — 2	Ignition: **OFF** N3 unplugged.	< 1 Ω	Wiring, Intermittent contact (X26/2).

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
34.0		**Charcoal canister purging** Operation		**Note to Test connection:** Connect vacuum tester to side connection (B) of purge valve (53): Model 124: (Figure 8), Model 129: (Figure 9, 11). Ignition: **OFF** Purge line (B, Figures 8, 9 or 11) disconnected from charcoal canister at purge valve. Engine: **at Idle** and at operating temperature. Slowly increase engine speed to a maximum of 3000 rpm.	Vacuum increases with increasing rpm.	Wiring, CFI control module (N3), Purge control valve (Y58/1), Check vacuum lines, ⇒ 13.0, Intermittent contact (X26/2).
34.1	23	Purge control valve (Y58/1) Control	N3 2 — V — 41	Engine: **at Idle** Increase engine speed to > 800 rpm	11 – 14 V	Wiring, N3, Y58/1, Intermittent contact (X26/2).
34.2		Purge control valve (Y58/1)	Y58/1 1 — Ω — 2	Ignition: **OFF** Connector on Y58/1 (Figures 8, 10) unplugged.	25 ± 5 Ω	Y58/1.

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
34.3		Wiring	N3 2 — Ω — Y58/1 — 1 41 — Ω — Y58/1 — 2	Ignition: **OFF** N3 unplugged.	< 1 Ω	Wiring, Intermittent contact (X26/2).
35.0		***Non-USA vehicles.*** ***Continue to next test step.***				
36.0 [1]		**Circuit 50** Activation	N3 6 — V — 11	Plug 2 on DI control module (N1/3) disconnected (Figure 7). Engine: **Start**	10 ± 2 V while cranking	Wiring (circuit 50).

[1] On-off ratio 70% when measured with on-off ratio tester.

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
37.0		**Deceleration shut-off** **Engine 104**		**Note to Test connection:** Connect to diagnostic socket (X11). Engine: **Start** Increase engine speed to 2000 – 2500 rpm, then close throttle valve.	On-off ratio momentarily jumps up to 95%.	Wiring, Check adjustment of linkage and throttle valve switch, S27/2.
37.1		Deceleration shut-off microswitch (S27/2)	N3 10 — Ω — 6	Ignition: **OFF** CFI control module (N3) unplugged. Accelerator pedal in CTP. Depress accelerator pedal.	 < 1 Ω ∞ Ω	 Open circuit, S27/2. Short circuit, S27/2.
37.2		Vehicles with ASR Idle speed switching signal	N3 6 — V — 41	Ignition: **ON** Accelerator pedal in CTP. Depress accelerator pedal.	 11 – 14 V < 1 V	ACCelerator pedal position sensor, Check EA/CC/ISC control module (N4/1), see DM, Engines, Vol. 2 – 6.1.

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
37.3		Electrohydraulic actuator (Y1) Current check	Y1 1 — ◄ –Ⓐ+ ► — 2	Ignition: **OFF** Connect test cable 102 589 04 63 00 to electrohydraulic actuator. Engine: **Start** Increase engine speed to 2000 – 2500 rpm and close throttle valve.	Momentarily approx. – 60 mA until combustion resumes.	⇒ 1.0 – 3.0 and ⇒ 10.0, N3.
38.0		**Engine 104** Kickdown cut-out Malfunction circuit **Engine 119** Kickdown cut-out Malfunction circuit	N16 7 — ◄ –Ⓐ+ ► — 1	Ignition: **OFF** Engine systems control module (N16) unplugged. Kickdown switch (S16/6) activated.	**Engine 104:** 450 ± 50 mA [1] 850 ± 50 mA [1] **Engine 119**: 450 ± 50 mA [1] 250 ± 50 mA [1]	Wiring, S16/6, AT kickdown valve (Y3, Figure 4).
38.1		Kickdown switch (S16/6) Voltage supply	N16 7 — ◄ –Ⓥ+ ► — 1	Ignition: **OFF** N16 unplugged. Ignition: **ON** Accelerator pedal in CTP. Accelerator pedal in kickdown position.	 < 1 V 11 – 14 V	s16/6, AT kickdown valve (Y3, Figure 4). Wiring, ⇒ 38.2.

[1] Nominal value may ary from one nanufacturer to annother.

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
38.2		Kickdown switch (S16/6) Resistance	S16/6 2 — Ω — 4	Ignition: **OFF** Kickdown switch (S16/6) activated. Kickdown switch (S16/6) not activated.	< 1 Ω ∞ Ω	S16/6.
38.3		AT kickdown valve (Y3) or kickdown solenoid valve (Y3/1y1) [2]	W11 — Ω — Y3 or Y3/1y1	Ignition: **OFF** Connector Y3 unplugged or, with 5-speed AT, valve block connector (Y3/1x1) disconnected.	12± 3 Ω [1] 28 ± 5 Ω [1]	Y3 or Y3/1y1.

1) Nominal value may ary from one nanufacturer to annother.

2) Kickdown solenoid valve (Y3/1y1) in 5-speed AT 722.5 only.

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
39.0		**EGR valve (static test)**		**Note to Test connection:** Connect vacuum tester to EGR valve. Apply 500 mbar vacuum. Disconnect vacuum line on EGR valve.	EGR valve closes audibly	EGR valve.
39.1		EGR valve (dynamic test)		**Note to Test connection:** Vacuum tester connected to EGR valve. Engine: **at Idle** Engine rpm > 1000 rpm	> 400 mbar	Vacuum lines, Vacuum supply, EGR switchover valve (Y27), Model 124: (Figure 5), Model 129: (Figure 6), Throttle valve housing.
40.0	16	**EGR switchover valve (Y27)** Control	N3 38 — ◄ V ► — 41	Engine: **at Idle** Engine rpm > 3000 rpm	Approx. 12 V	Wiring, CFI control module (N3).
40.1		EGR switchover valve (Y27)	Y27 — ▬ — Ω — ▬ —	Ignition: **OFF**	30 ± 5 Ω	Y27: Model 124: (Figure 5), Model 129: (Figure 6).
40.2		Wiring	N3 38 — ◄ Ω ► — 1 41 — ◄ Ω ► — 2 Y27	Ignition: **OFF** N3 and Y27 unplugged.	< 1 Ω	Wiring.

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
41.0		***Non-USA vehicles.*** ***Continue to next test step.***				
42.0		***Non-USA vehicles.*** ***Continue to next test step.***				
43.0		***Non-USA vehicles.*** ***Continue to next test step.***				

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
44.0		**Transmission upshift delay relay module (K29)** Solenoid valve (Y3/2) Control	W11 ⊥ (−) V (+) Y3/2 ❩—	Ignition: **OFF** ECT sensor (B11/2) unplugged. Using two resistance substitution units, simulate 2.5 kΩ resistance (+ 20°C) at sockets 2 and 4 as well as at sockets 1 and 3 (Figure 12). Engine: **at Idle**	11 – 14 V Engine 104: max. 80 sec. Engine 119: max. 120 sec.	⇒ 44.1, ⇒ 44.2, ⇒ 44.3, ⇒ 44.4, CFI control module (N3), K29.
44.1		Transmission upshift delay relay module (K29) Voltage supply	W11 ⊥ (−) V (+) K29 ❩— 3 W11 ⊥ (−) V (+) K29 ❩— 4	Ignition: **OFF** K29 unplugged: Model 124: (Figure 16), Model 129: (Figure 17). Ignition: **ON**	11 – 14 V 11 – 14 V	Overvoltage protection relay (K1/1), Wiring.

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
44.2		Wiring to solenoid valve (Y3/2)	K29 1 — 4 W11 — Y3/2x1 ⊥ — V —	Ignition: **OFF** Transmission upshift delay relay (K29) unplugged: Model 124: Figure 16 Model 129: Figure 17 Solenoid valve connector (Y3/2x1) unplugged. Ignition: **ON**	11 – 14 V	Open circuit.
44.3		Solenoid valve (Y3/2)	Y3/2 ⊥ — Ω —	Ignition: **OFF** Solenoid valve connector (Y3/2x1) unplugged.	10 – 18 Ω	Y3/2.
44.4		Wiring from CFI control module (N3) to transmission upshift delay relay module (K29)	K29 — N3 5 — Ω — 39	Ignition: **OFF** Socket box connected to N3. K29 unplugged.	< 1 Ω	Open circuit.

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
45.0		**Transmission upshift delay switchover valve (Y3/3)** Operation		Note to Test connection: Disconnect vacuum line (Figure 38) on Y3/3. Connect vacuum tester with Y-distributor to Y3/3. Ignition: **OFF** ECT sensor (B11/2) unplugged. Using two resistance substitution units, simulate 2.5 kΩ resistance (+ 20oC) at sockets 2 and 4 as well as at sockets 1 and 3 (Figure 12). Engine: **at Idle**	> 400 mbar (for a maximum of 80 seconds)	Control of Y3/3, Short/open circuit, Y3/3 defective, Vacuum element for transmission upshift delay, Vacuum line.

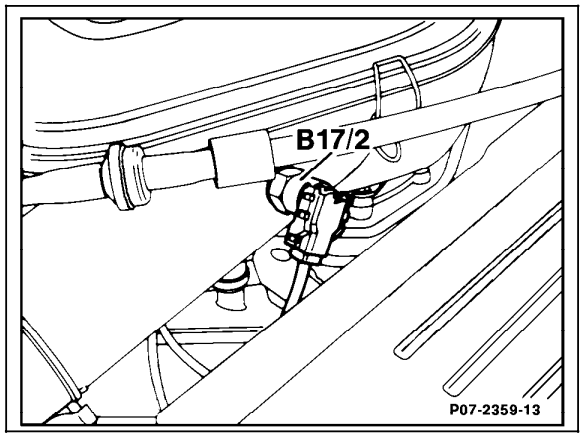
Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
45.1		Control	W11 ⊥ — V — Y3/3 2 Y3/3 1 — V — +	Ignition: **OFF** Connector of Y3/3 (Figure 38) unplugged. Using two resistance substitution units, simulate 2.5 kΩ resistance (+ 20oC) at sockets 2 and 4 as well as at sockets 1 and 3 (Figure 12).	11 – 14 V	Overvoltage protection relay module (K1/1), Short/open circuit.
				Engine: **Start**	11 – 14 V (for a maximum of 80 seconds)	Short/open circuit, CFI control module (N3).
45.2		Coil resistance	Y3/3 1 — Ω — Y3/3 2	Ignition: **OFF** Connector of Y3/3 (Figure 38) unplugged.	25 – 40 Ω	Y3/3 defective.

Electrical Test Program – Test

Temperature (°C)	Resistance (Ω)	Voltage (V) at IAT sensor (B17/2)	Voltage (V) at ECT sensor (B11/2)
– 20	15700	2.85 – 3.49	5.12 – 5.60
– 10	10000	2.50 – 3.06	4.49 – 5.11
0	5900	2.10 – 2.56	4.12 – 4.48
10	3700	1.69 – 2.07	3.77 – 4.11
20	2500	1.32 – 1.62	3.36 – 3.76
30	1700	1.03 – 1.25	2.92 – 3.35
40	1170	0.77 – 0.94	2.51 – 2.91
50	830	0.57 – 0.69	2.09 – 2.50
60	600	0.42 – 0.52	1.69 – 2.08
70	435	0.32 – 0.40	1.36 – 1.68
80	325	0.25 – 0.31	1.09 – 1.35
90	245	0.18 – 0.22	0.88 – 1.08
100	185	0.14 – 0.17	0.75 – 0.87

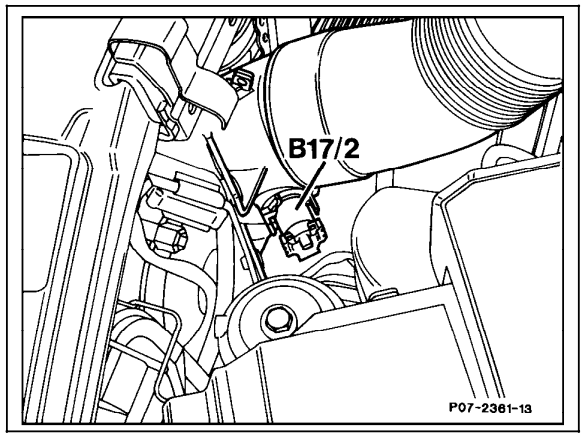
Electrical Test Program – Test



P07-2359-13

Figure 1
Engine 104

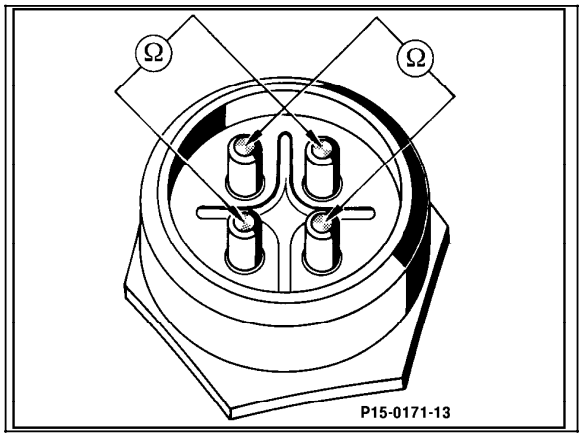
B17/2 IAT sensor



P07-2361-13

Figure 2
Engine 119

B17/2 IAT sensor

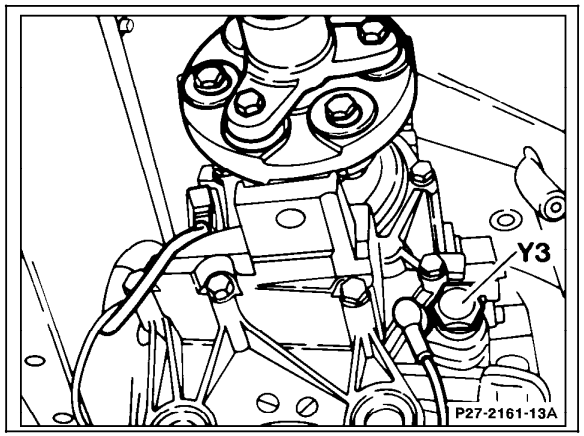


P15-0171-13

Figure 3

B11/2 ECT sensor (4-pole)

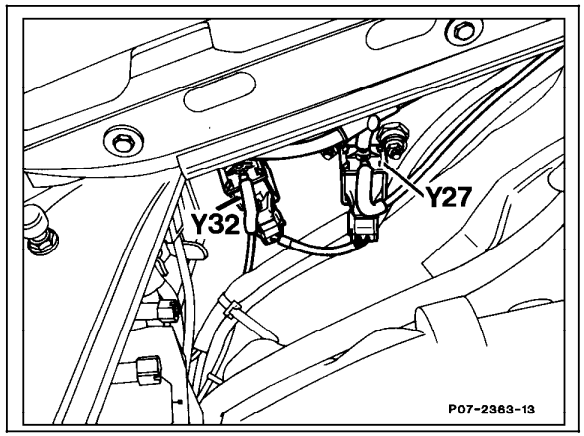
Electrical Test Program – Test



P27-2161-13A

Figure 4

Y3 Kickdown valve (AT)

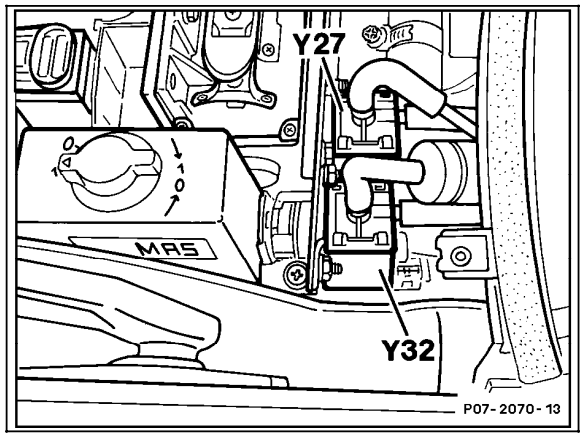


P07-2363-13

Figure 5
Model 124

Y27 EGR switchover valve

Y32 AIR pump switchover valve



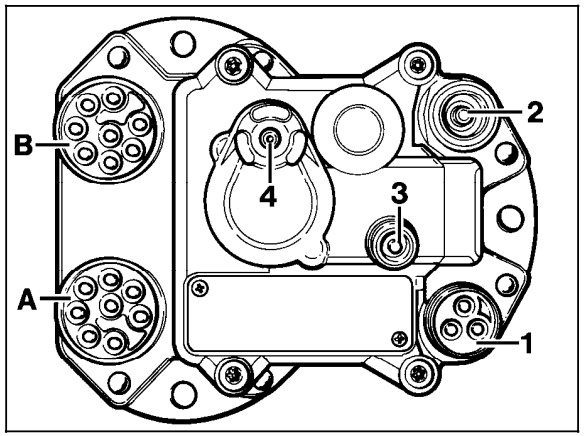
P07-2070-13

Figure 6
Model 129

Y27 EGR switchover valve

Y32 AIR pump switchover valve

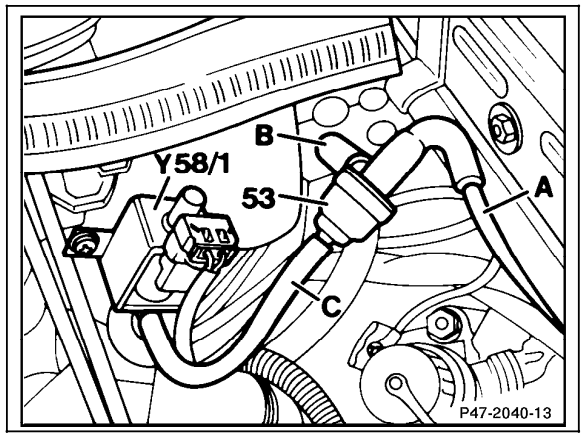
Electrical Test Program – Test



P15-2030-13A

Figure 7
DI control module

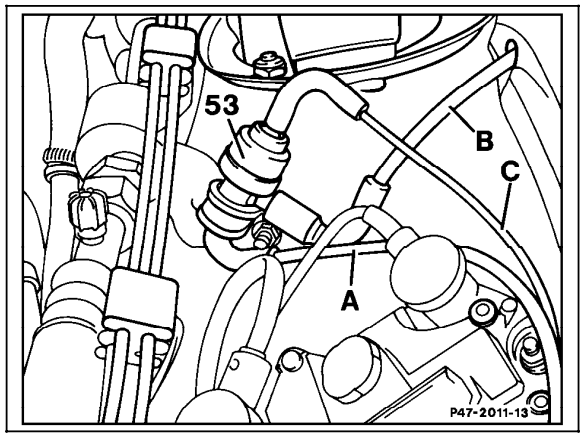
1	Knock sensor
2	CKP sensor (L5)
3	Reference resistor
4	Vacuum connection
A	8-pole plug connection
B	8-pole plug connection



P47-2040-13

Figure 8
Engine 104, Model 124

53	Purge valve
Y58/1	Purge control valve
A	Purge line (to throttle valve)
B	Purge line (to charcoal canister)
C	Purge control valve vacuum line

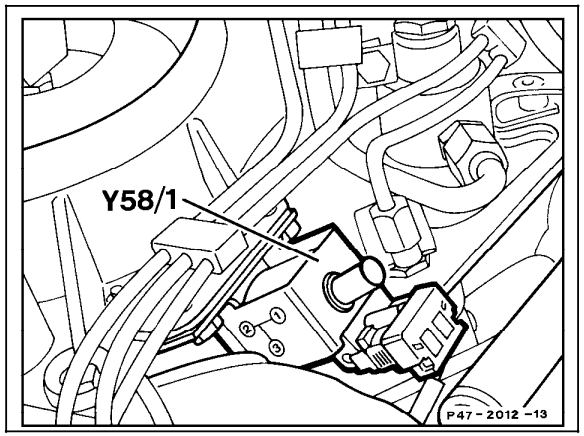


P47-2011-13

Figure 9
Engine 104, Model 129

53	Purge valve
Y58/1	Follow vacuum line “C“ for location

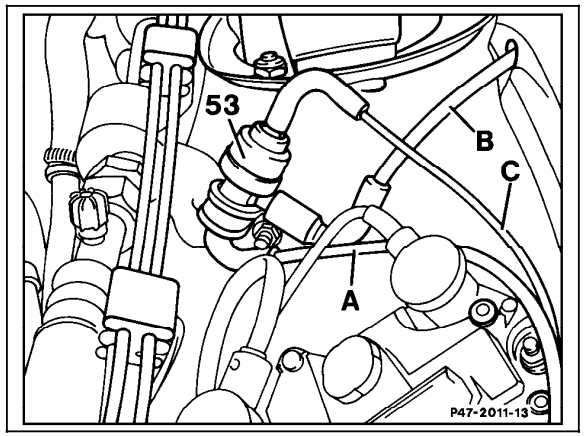
Electrical Test Program – Test



P47-2012-13

Figure 10
Engine 119, Model 129

Y58/1 Purge control valve



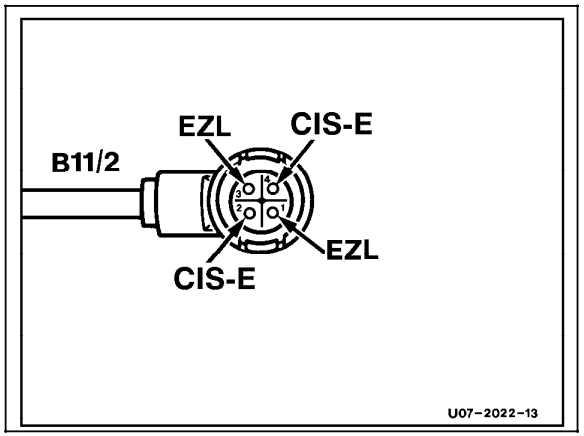
P47-2011-13

Figure 11
Engine 119, Model 129

53 Purge valveA Purge line (to throttle valve)

B Purge line (to charcoal canister)

C Purge control valve vacuum line

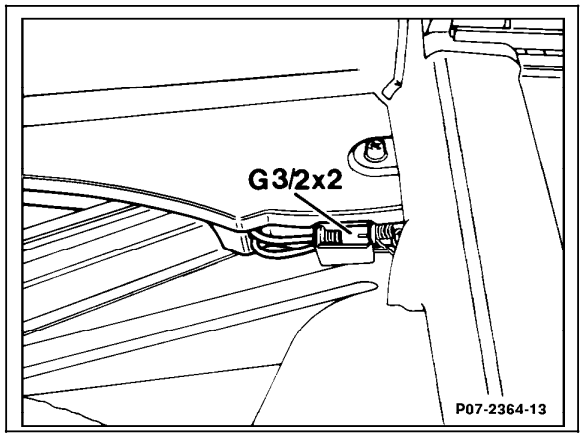


U07-2022-13

Figure 12
Model 124

B11/2 ECT sensor (4-pole), terminal layout

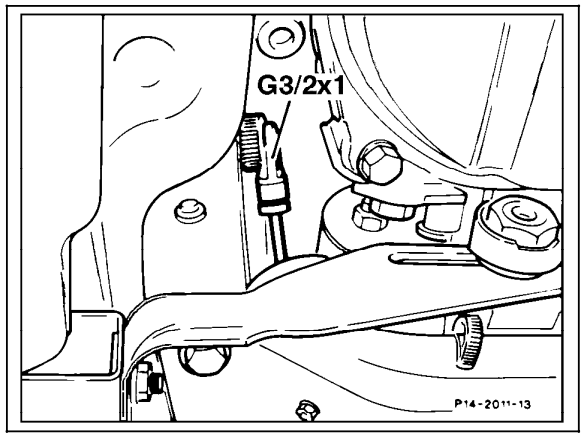
Electrical Test Program – Test



P07-2364-13

Figure 13
Model 124

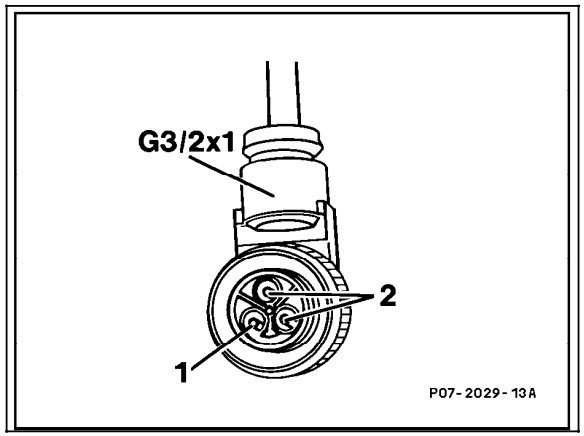
G3/2x2 O2S 1 signal connector



P14-2011-13

Figure 14
Model 129

G3/2x1 O2S 1 connector (before TWC)



P07-2029-13A

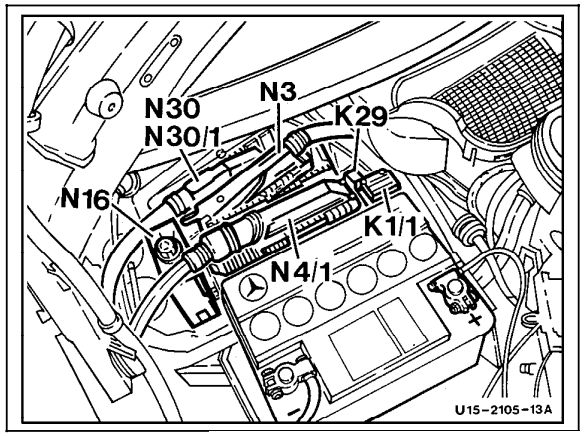
Figure 15
Model 129

1 O2S 2 signal

2 O2S 1 heater

G3/2x1 O2S 1 connector (before TWC)

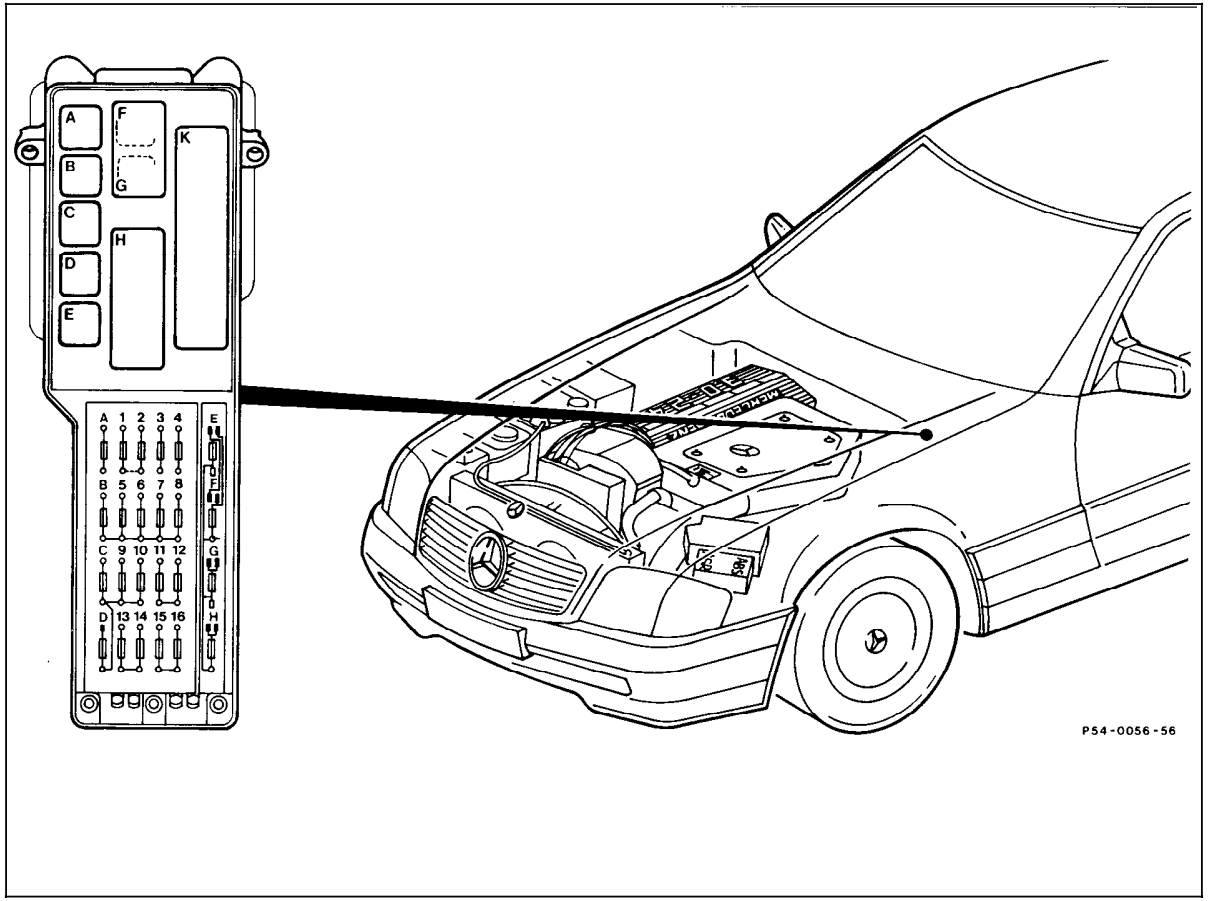
Electrical Test Program – Test



P15-2105-13A

Figure 16
Model 124

K29 Transmission upshift delay relay module

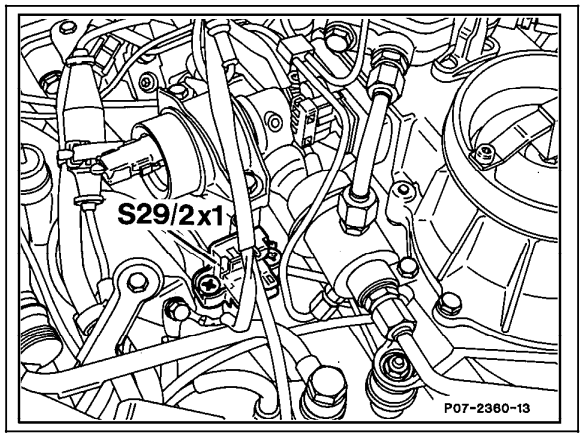


P54-0056-56

Figure 17
Model 129

K29 Transmission upshift delay relay module (location E)

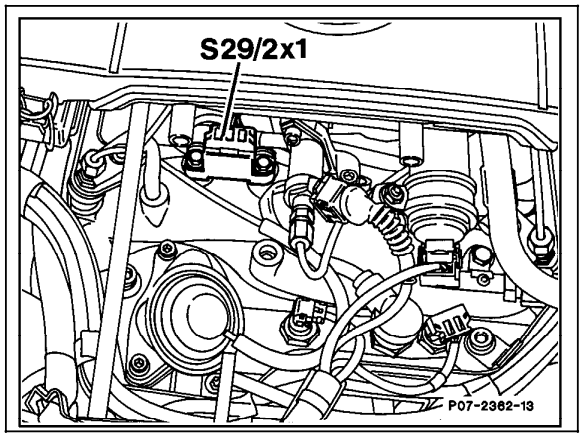
Electrical Test Program – Test



P07-2360-13

Figure 18
Engine 104

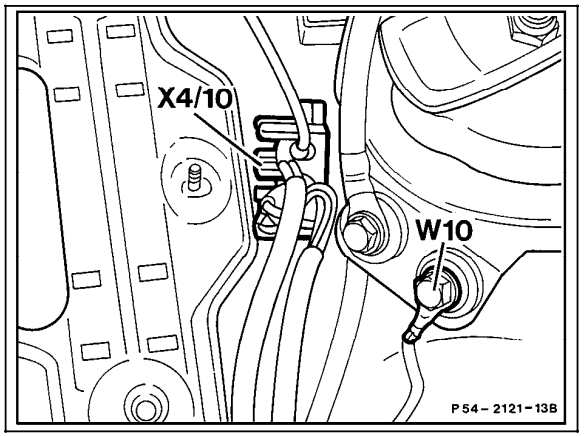
S29/2x1 WOT/CTP switch connector



P07-2362-13

Figure 19
Engine 119

S29/2x1 WOT/CTP switch connector

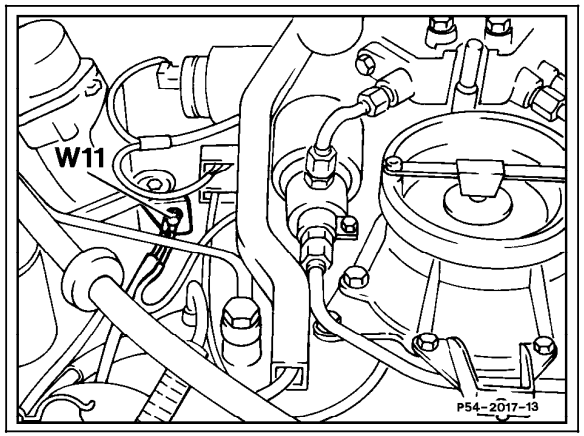


P54-2121-13B

Figure 20
Model 124

W10 Ground (battery)

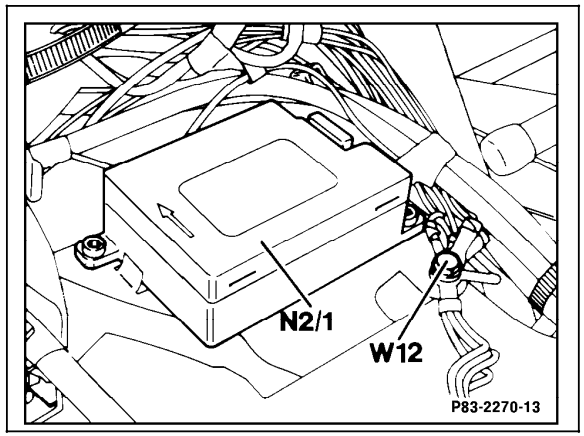
Electrical Test Program – Test



P54-2017-13

Figure 21

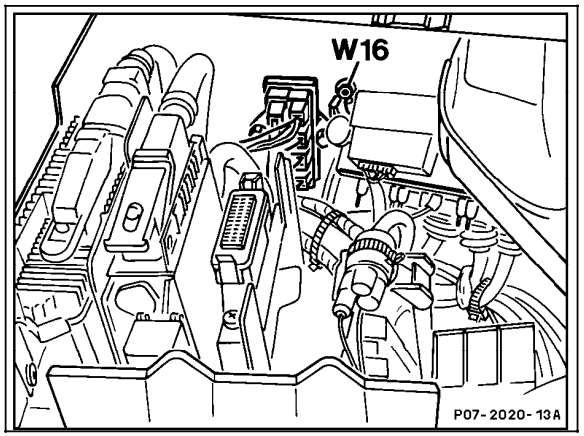
W11 Ground (engine - connection point for ground wires)



P83-2270-13

Figure 22
Model 124

W12 Ground (center console)

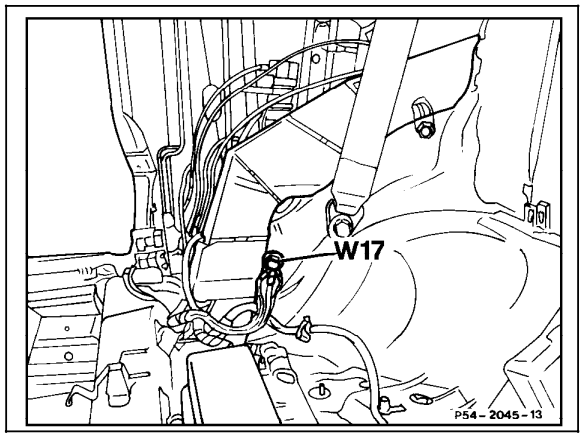


P07-2020-13A

Figure 23
Model 129

W16 Ground (component compartment)

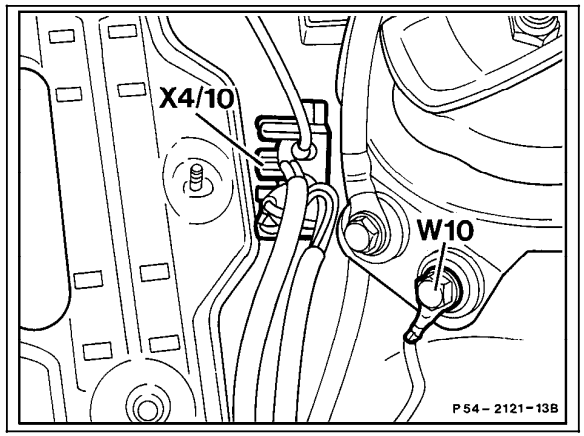
Electrical Test Program – Test



P54-2045-13

Figure 24
Model 129

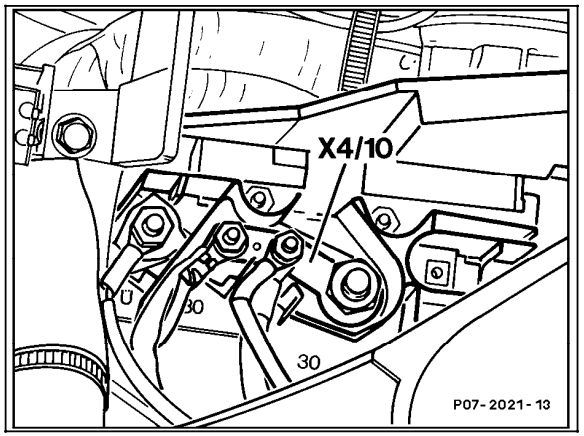
W17 Ground (right rear storage area)



P54-2121-13B

Figure 25
Model 124

X4/10 Terminal block (circuit 30/30Ü/61e/87L) (6-pole)

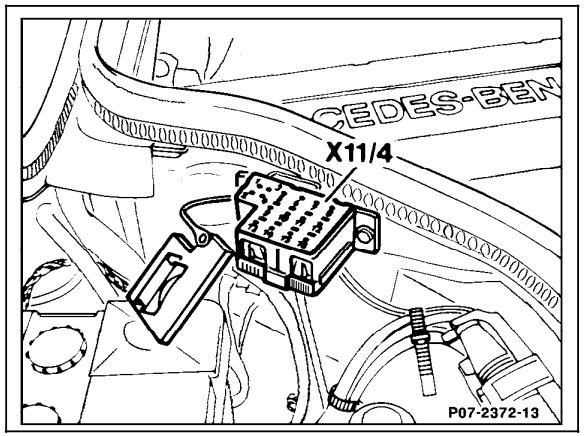


P07-2021-13

Figure 26
Model 129

X4/10 Terminal block (circuit 30/30Ü/61e/87L) (6-pole)

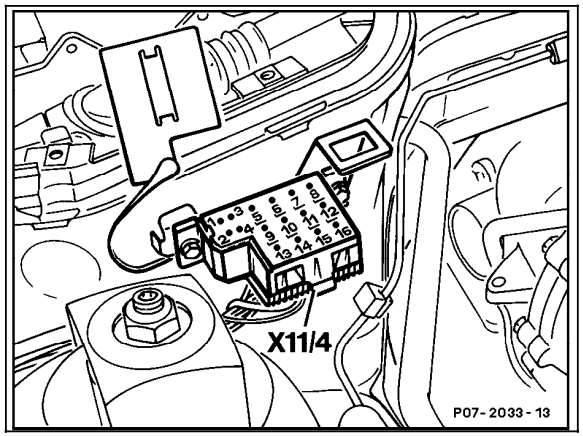
Electrical Test Program – Test



P07-2372-13

Figure 27
Model 124

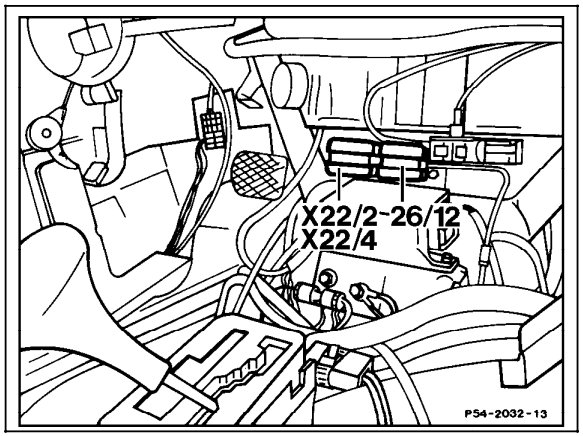
X11/4 Data link connector (DTC readout)



P07-2033-13

Figure 28
Model 129

X11/4 Data link connector (DTC readout)

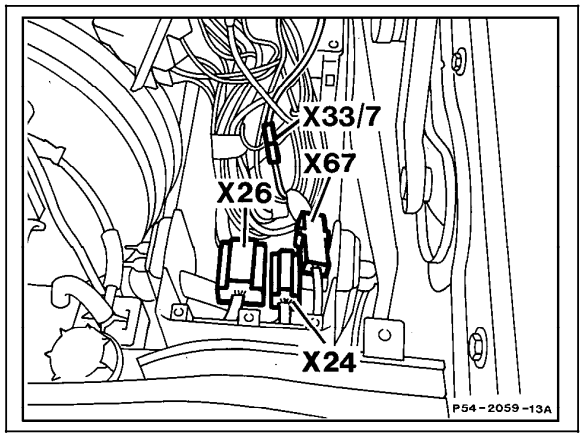


P54-2032-13

Figure 29
Model 129

X22/2 AT/engine connector (8-pole)

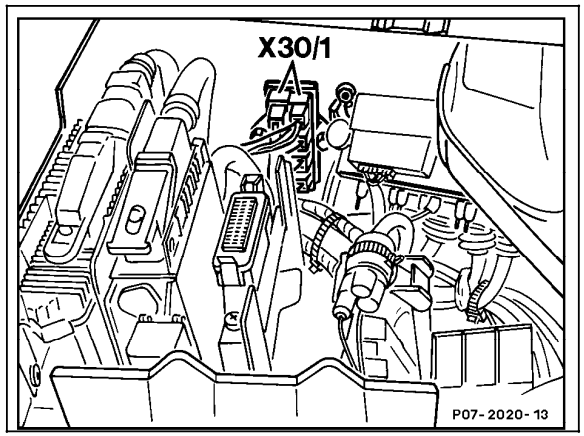
Electrical Test Program – Test



P54-2059-13A

Figure 30
Model 124

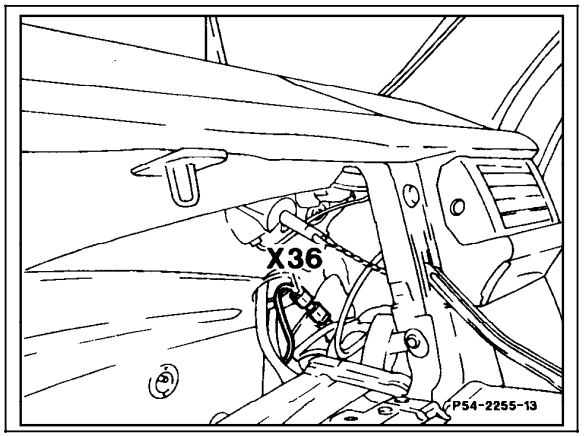
X26 Interior/engine connector (12-pole)



P07-2020-13

Figure 31
Model 129

X30/1 Multi-function connector block

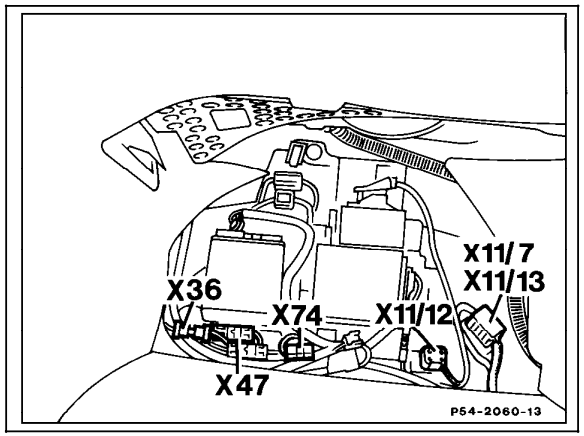


P54-2255-13

Figure 32
Model 124

X36 FP harness connector (1-pole)

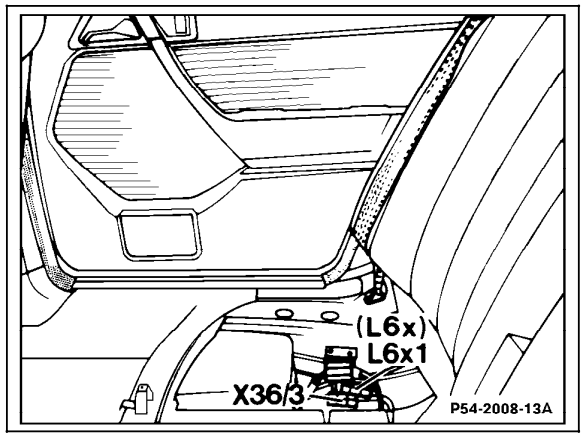
Electrical Test Program – Test



P54-2060-13

Figure 33
Model 129

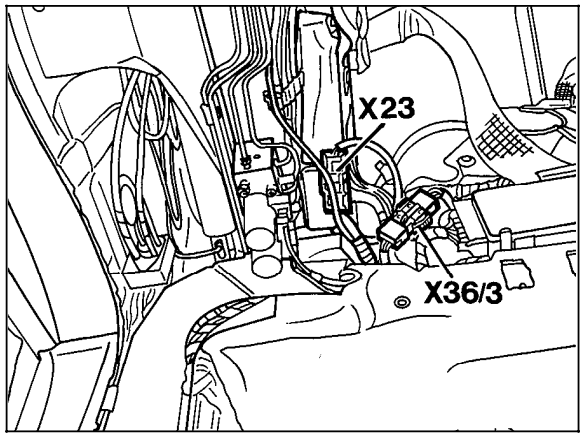
X36 FP harness connector (1-pole)



P54-2008-13A

Figure 34
Model 124

X36/3 FP harness connector (2-pole)

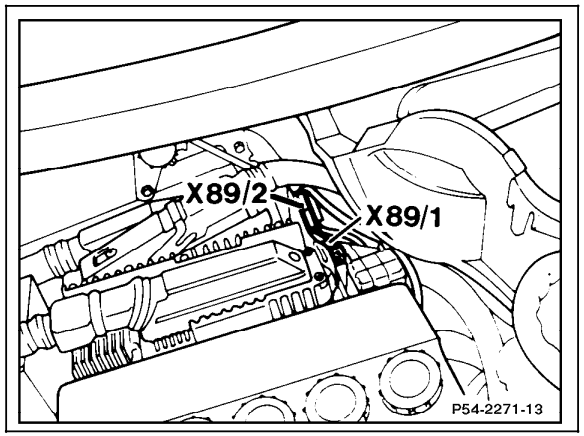


P54-2036-13

Figure 35
Model 129

X36/3 FP harness connector (2-pole)

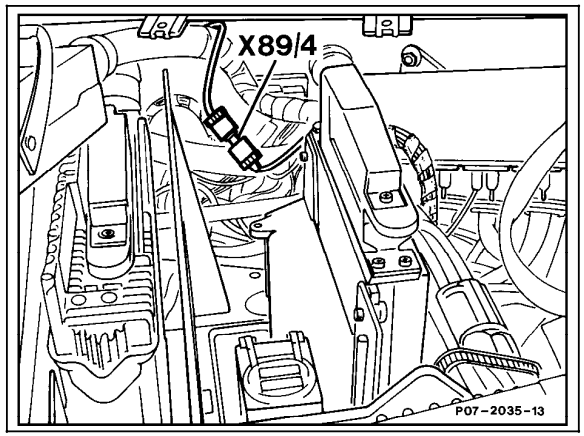
Electrical Test Program – Test



P54-2271-13

Figure 36
Model 124

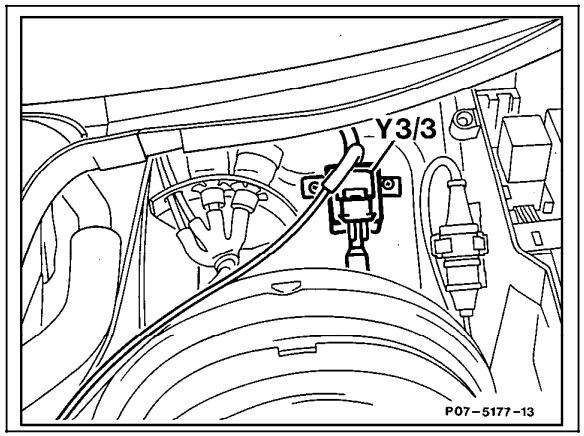
X89/2 EA control module/engine harness connector (3-pole)



P07-2035-13

Figure 37
Model 129, Engine 104

X89/4 EA control module/CFI connector (1-pole)



P07-5177-13

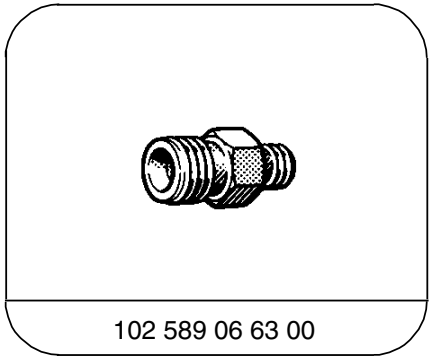
Figure 38
Model 124 (model 129 location similar)

Y3/3 Upshift delay switchover valve

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

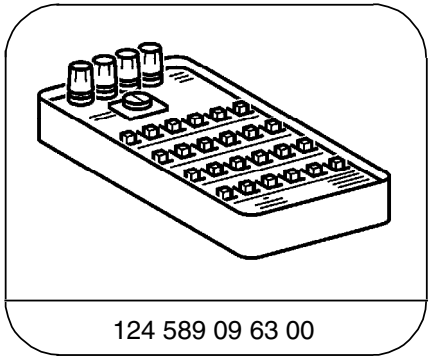
Preliminary work:
Removal/installation of air filter 09-400

Special Tools



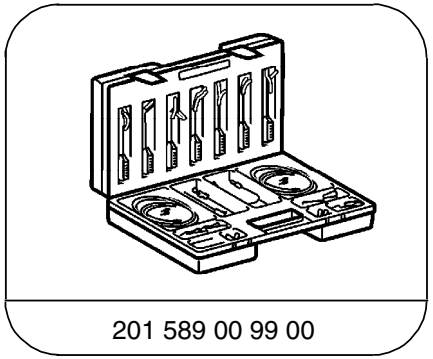
102 589 06 63 00

Double connection



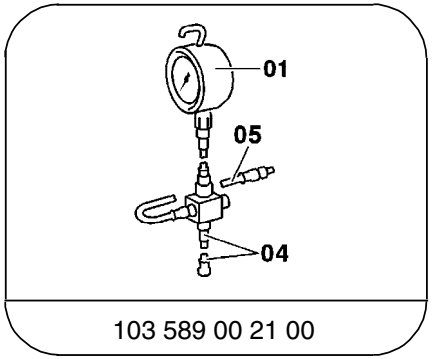
124 589 09 63 00

Ohm decade



201 589 00 99 00

Electrical connecting set



103 589 00 21 00

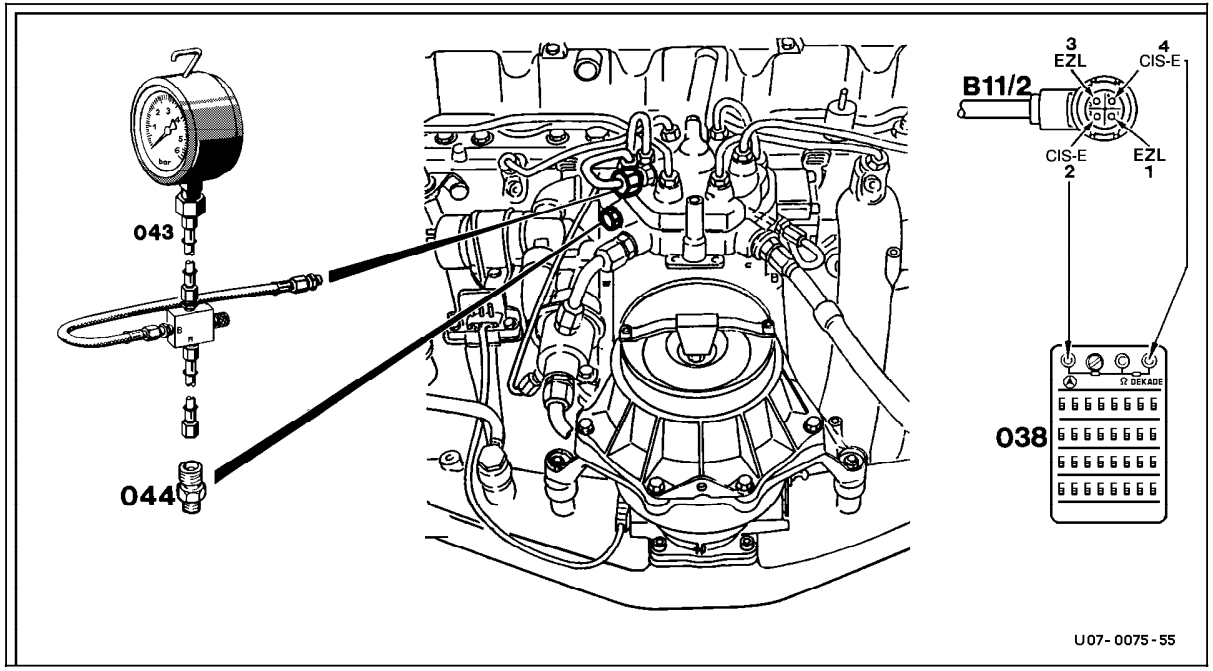
Tester

Note:

- The leakage test should only be performed in cases of starting complaints.
- If there is no reaction to test steps 6 and 7, then perform 23 ⇒ 1.0 – 3.0 first.

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

Connection Diagram – Engine 104



U07-0075-55

Figure 1

038 Resistance substitution unit
043 Pressure gauge, part no. 103 589 00 21 00
044 Adaptor, part no. 102 589 06 63 00
B11/2 ECT sensor (connector)

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

Connection Diagram – Engine 119

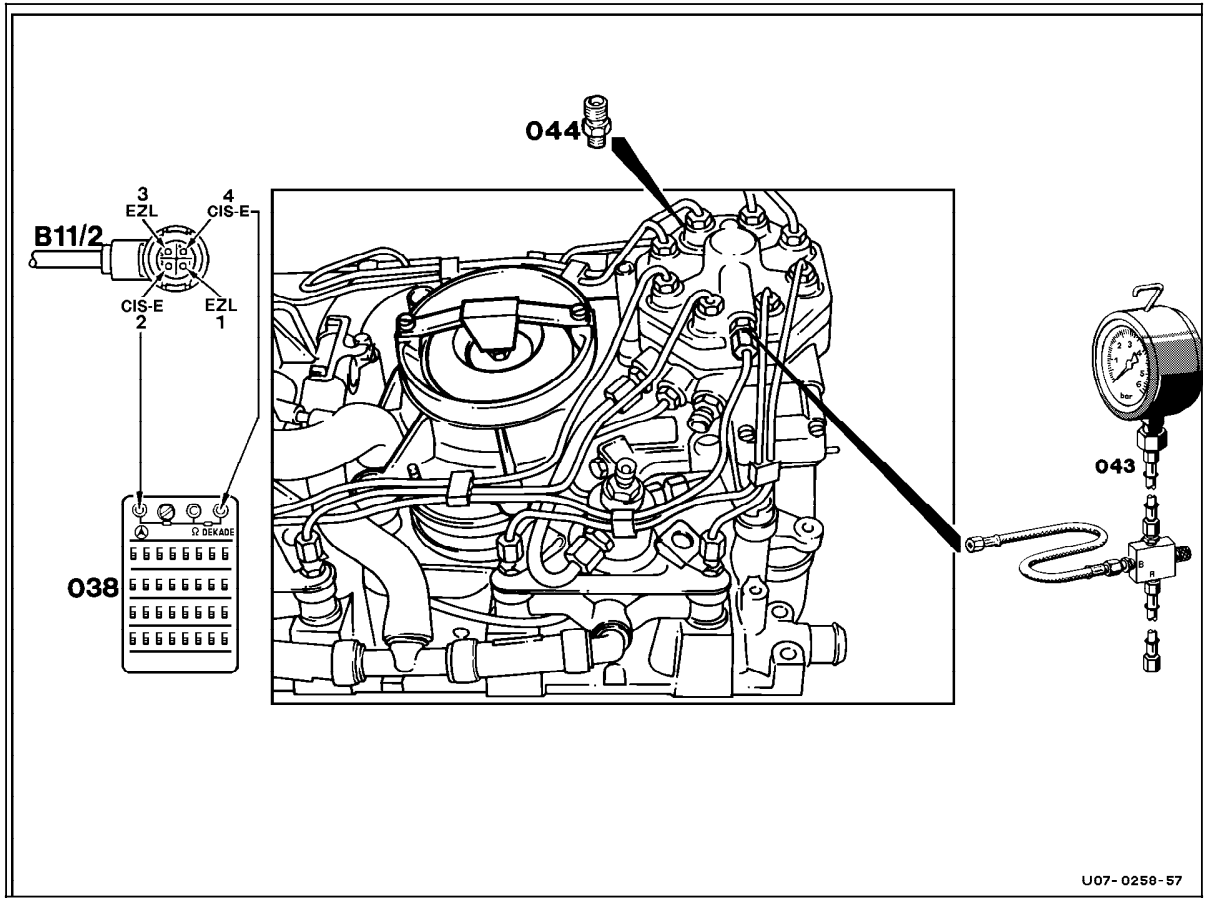


Figure 2

038 Resistance substitution unit
043 Pressure gauge, part no. 103 589 00 21 00
044 Adaptor, part no. 102 589 06 63 00
B11/2 ECT sensor (connector)

U07-0258-57

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

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
1.0		Fuel connections		Check for leakage.		
2.0		Check for ease of movement of air flow sensor plate (4) with lever (1) and control plunger (2) in fuel distributor (32, Figure 1).		Switch on ignition briefly to build up fuel pressure.		
				Depress air flow sensor plate (4) by hand (Figure 1).	Uniform resistance should be felt during its entire travel.	Center/replace air flow sensor plate, ⇒ 2.1.
				Release air flow sensor plate (4) quickly.	No resistance should be felt since the slow to react control plunger (2) lifts off the lever (1, Figure 1).	Replace air flow sensor.

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

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
2.1		Control plunger		Depress air flow sensor plate (4) by hand. Release air flow sensor plate (4) slowly.	Control plunger (2) should remain in contact with the lever (1).	Replace fuel distributor.
3.0		Check control plunger (2, Figure 1) in fuel distributor for leakage.		Press air flow sensor plate (4) completely down and hold in this position (illuminate intake with borescope).	Slight seepage (drops) is permissible.	Replace fuel distributor.
4.0		Fuel pressures		**Note to Test connection:** Connect pressure gauge. Connect hose “A“ to lower chamber using adaptor (044), connect hose “B“ to upper chamber, 31, Figures 1 or 2. ⚠ When connecting pressure gauge, do not contact air flow sensor with wrench.		

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

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
4.1		System pressure		Engine: **at Idle** Valve on pressure gauge open.	6.2 – 6.4 bar	Check fuel pump, Replace diaphragm pressure regulator, Check fuel return line for restrictions.
4.2		Lower chamber pressure		Engine: **at Idle**and at operating temperature. Electrohydraulic actuator connector unplugged, valve on pressure gauge closed.	Approx. 0.4 bar below system pressure.	Replace electrohydraulic actuator (Y1)
5.0		Deceleration shut-off (Engine 104 only)		**Note to Test connection:** Pressure gauge. Engine: **at Idle**and at operating temperature. Raise engine speed to 2500 rpm and then close throttle valve.	Lower chamber pressure must increase to system pressure until combustion resumes.	Check deceleration shut-off, see 23 ⇒ 37.0.

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

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
6.0		Acceleration enrichment		**Note to Test connection:** Pressure gauge. Ignition: **OFF** ECT sensor (B11/2) unplugged. Using two resistance substitution units, simulate 2.5 kΩ resistance (+ 20°C) at sockets 2 and 4 as well as at sockets 1 and 3 (32, Figures 2 and 3). Engine: **at Idle** Rev engine abruptly.	Approx. 0.5 bar below system pressure Pressure in lower chamber must decrease to < 5.5 bar.	23 ⇒ 1.0, 23 ⇒ 10.0, 23 ⇒ 14.0.
7.0		Fuel system leakage		**Note to Test connection:** Pressure gauge. Engine: **OFF**	System pressure drops below opening pressure of injectors to approx. 3.5 bar.	If pressure drops immediately to 0 bar, replace check valve in fuel pump. If pressure drops slowly below 3.5 bar, ⇒ 7.1 – 7.4

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

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
7.1		Diaphragm pressure regulator		Disconnect fuel return line at diaphragm pressure regulator.	No fuel should flow out of diaphragm pressure regulator (slight seepage is permissible). ⚠ If fuel flows out of the fuel return line, plug line immediately.	Replace diaphragm pressure regulator.
7.2		Fuel accumulator		**Note to Test connection:** Pressure gauge. Pinch leak-off line on fuel accumulator.	Fuel pressure should no longer drop.	Replace fuel accumulator.
7.3		Start valve				33 or 34.
7.4		Fuel distributor		Test steps 7.1 – 7.3 ok		Replace fuel distributor.

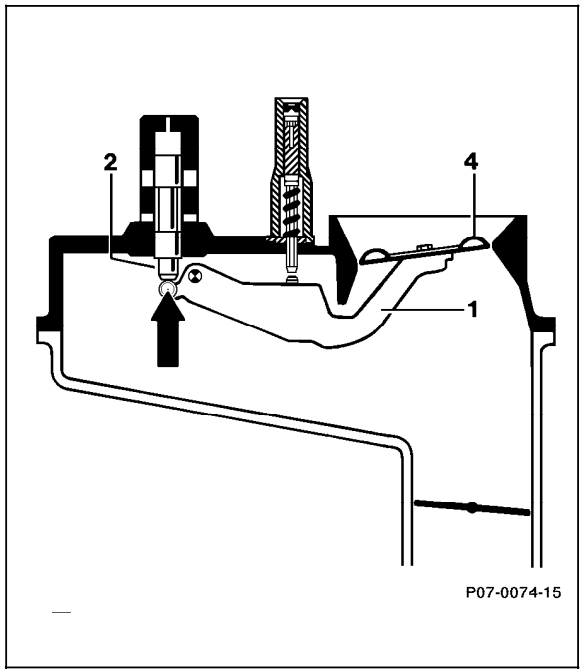
Hydraulic Test Program – Test (Testing Fuel System Pressure and Internal Leakage)

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
7.5		External leakage		Disconnect pressure gauge, wiping up any spilt fuel with a rag. Reconnect fuel lines. Engine: at Idle	All fuel connections must be tight (no leaks).	

Table I Fuel pressures

System pressure	with engine cold or at operating temperature		bar	6.2 – 6.4
Lower chamber pressure	with engine at operating temperature	below the previously measured system pressure	bar	approx. 0.4
	at a coolant temperature of + 20°C	at idle, below the previously measured system pressure	bar	approx. 0.5
	durind deceleration shut-off		bar	Lower chamber pressure equals system pressure
Sustained system pressure	30 minutes after shutting off engine		bar	minimum 2.8

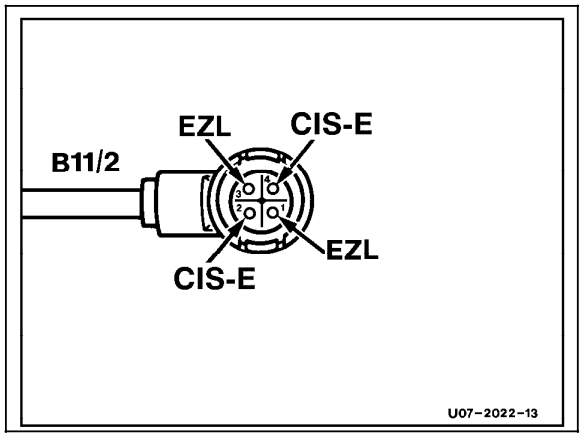
Electrical Test Program – Test



P07-0074-15

Figure 1

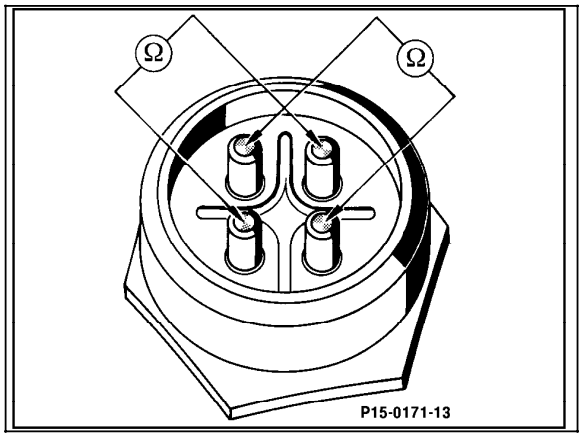
1 Lever
2 Control plunger
4 Air flow sensor plate



U07-2022-13

Figure 2

B11/2 ECT sensor (4-pole)



P15-0171-13

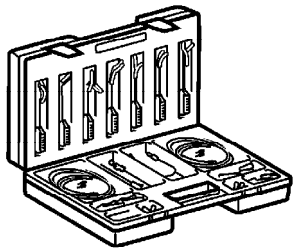
Figure 3

ECT sensor (4-pole)

Hydraulic Test Program – Preparation for Test (Testing Starting System)

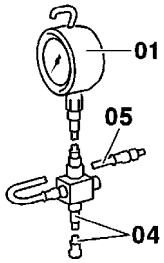
Preliminary work:
Testing Fuel System Pressure and Internal Leakage 31

Special Tools



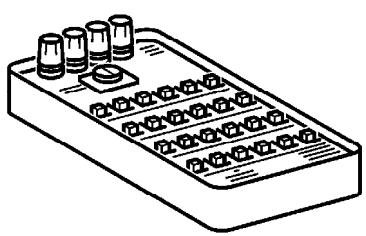
201 589 00 99 00

Electrical connecting set



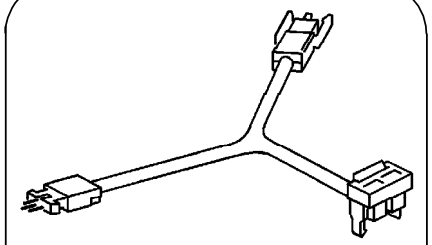
103 589 00 21 00

Tester



124 589 09 63 00

Ohm decade



102 589 04 63 00

Test cable

102 589 06 63 00

Double connection

Conventional tools, test equipment

Description	Brand, model, etc.
Multimeter [1)]	Fluke models 23, 83, 85, 87

1) Available through the MBUSA Standard Equipment Program.

Hydraulic Test Program – Preparation for Test (Testing Starting System)

Connection Diagram – Engine 104

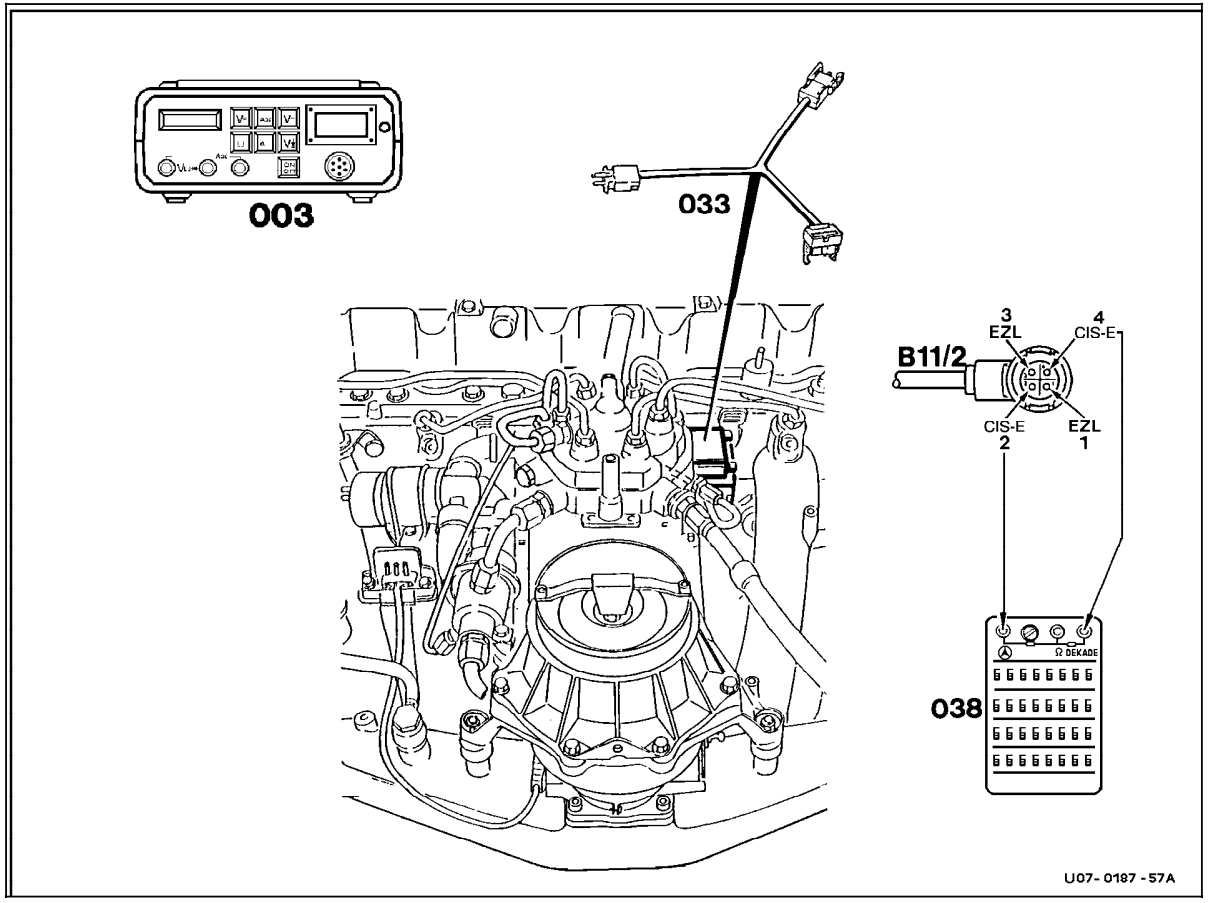


Figure 1

003 Multimeter
033 Test cable
038 Resistance substitution unit
B11/2 ECT sensor (connector)

U07-0187-57A

Hydraulic Test Program – Preparation for Test (Testing Starting System)

Connection Diagram – Engine 119

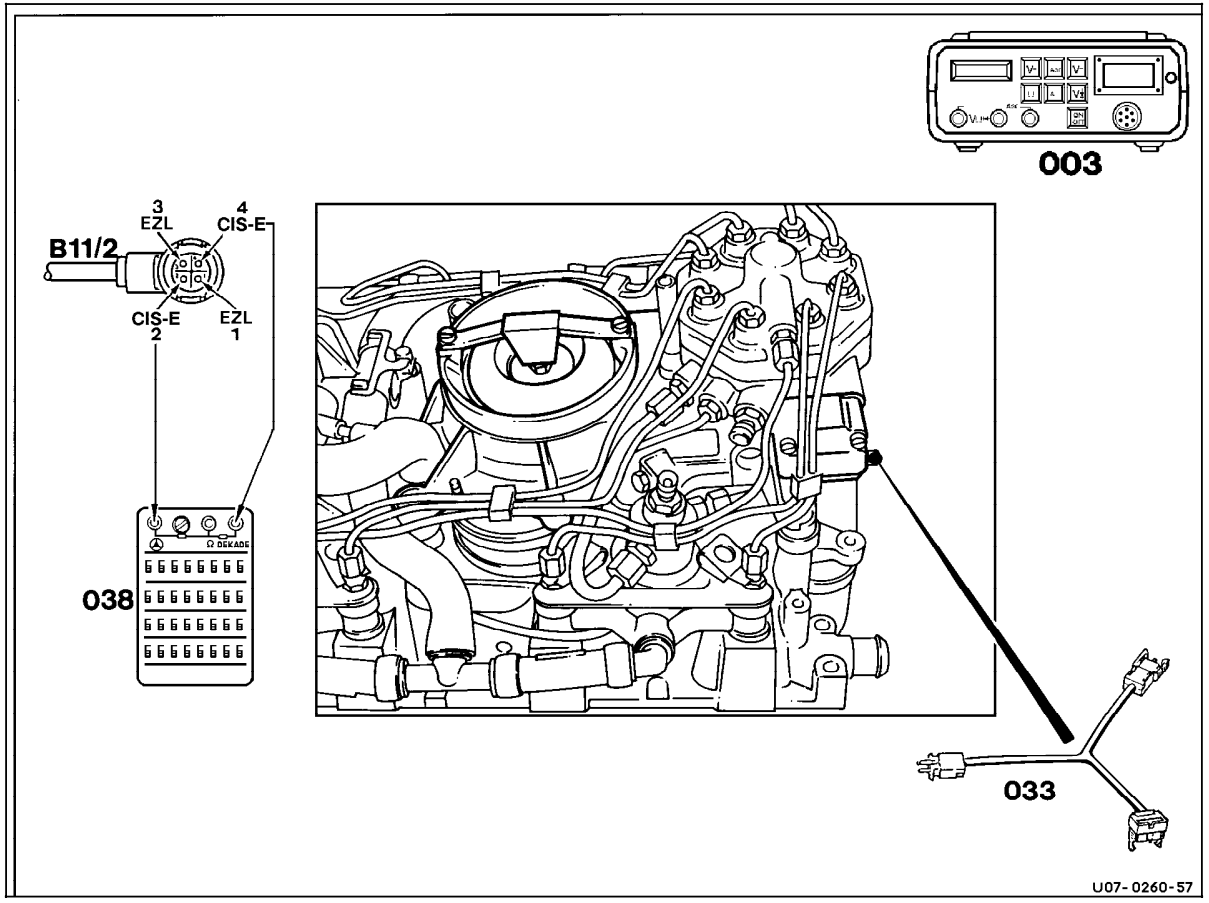


Figure 2

003 Multimeter
033 Test cable
038 Resistance substitution unit
B11/2 ECT sensor (connector)

U07-0260-57

Hydraulic Test Program – Test (Testing Starting System)

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
1.0		Check operation of start valve and for leakage		Ignition: **OFF** Remove start valve and reconnect to fuel line. ECT sensor (B11/2) unplugged. Using two resistance substitution units, simulate 10 kΩ resistance (– 10°C) at connector sockets 2 and 4 as well as at sockets 1 and 3 (33, Figure 1 and 2). Hold start valve in a container. Engine: **Start**	Start valve must spray fuel while cranking starter.	Replace start valve. Check electrical control of start valve, see 23 ⇒ 31.0.
				Ignition: **OFF** Wipe start valve nozzle dry.	No drops of fuel should form.	Replace start valve.

Hydraulic Test Program – Test (Testing Starting System)

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
2.0		After-start enrichment	Y1 1 — ◄ –Ⓐ+ ► — 2	Ignition: OFF Connect test cable (033) to electrohydraulic actuator (Y1). ECT sensor (B11/2) unplugged. Using two resistance substitution units, simulate 10 kΩ resistance (– 10°C) at connector sockets 2 and 4 as well as at sockets 1 and 3 (33, Figure 1 and 2). Engine: **Start**	See Table I for current values.	23 ⇒ 13.0.

Hydraulic Test Program – Test (Testing Starting System)

Table I Test and Adjustment Data

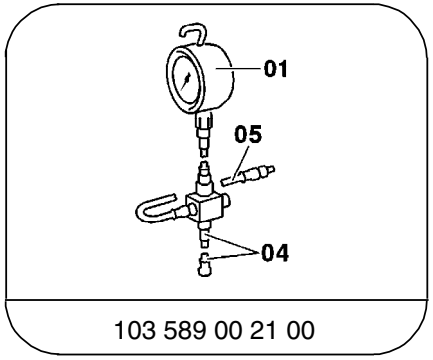
Engine	Current at EHA with ignition ON (mA)	After-start enrichment at an engine coolant temperature of + 20°C (mA)
104	20	3 – 5 [1)]
119	75	5 – 8 [1)]

[1)] Read value 0 – 15 seconds after startup.

Hydraulic Test Program – Preparation for Test (Testing Fuel Pumps)

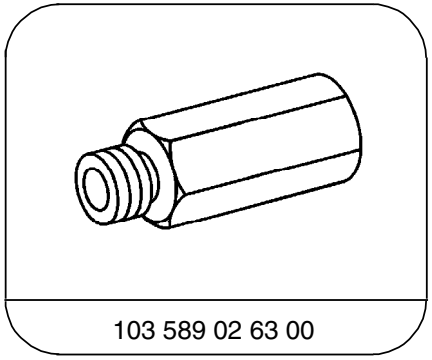
Preliminary work:
Check system pressure (see Testing Fuel System Pressure and Internal Leakage 31

Special Tools



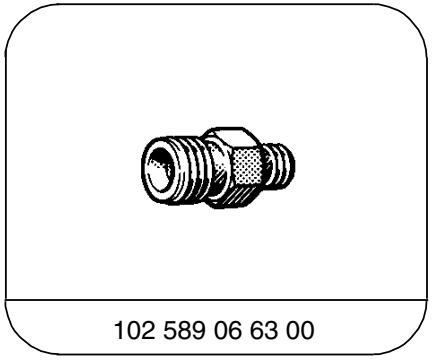
103 589 00 21 00

Tester



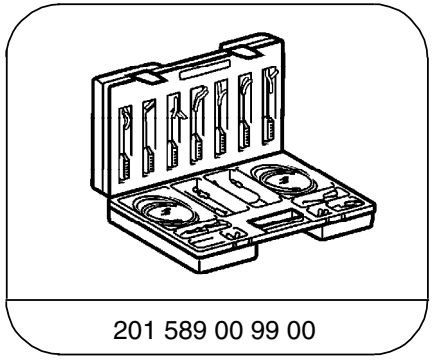
103 589 02 63 00

Adapter



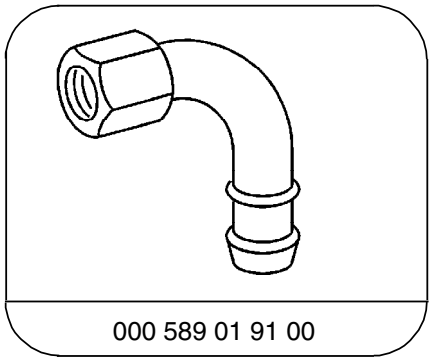
102 589 06 63 00

Double connection



201 589 00 99 00

Electrical connecting set



000 589 01 91 00

Elbow fitting

Hydraulic Test Program – Preparation for Test (Testing Fuel Pumps)

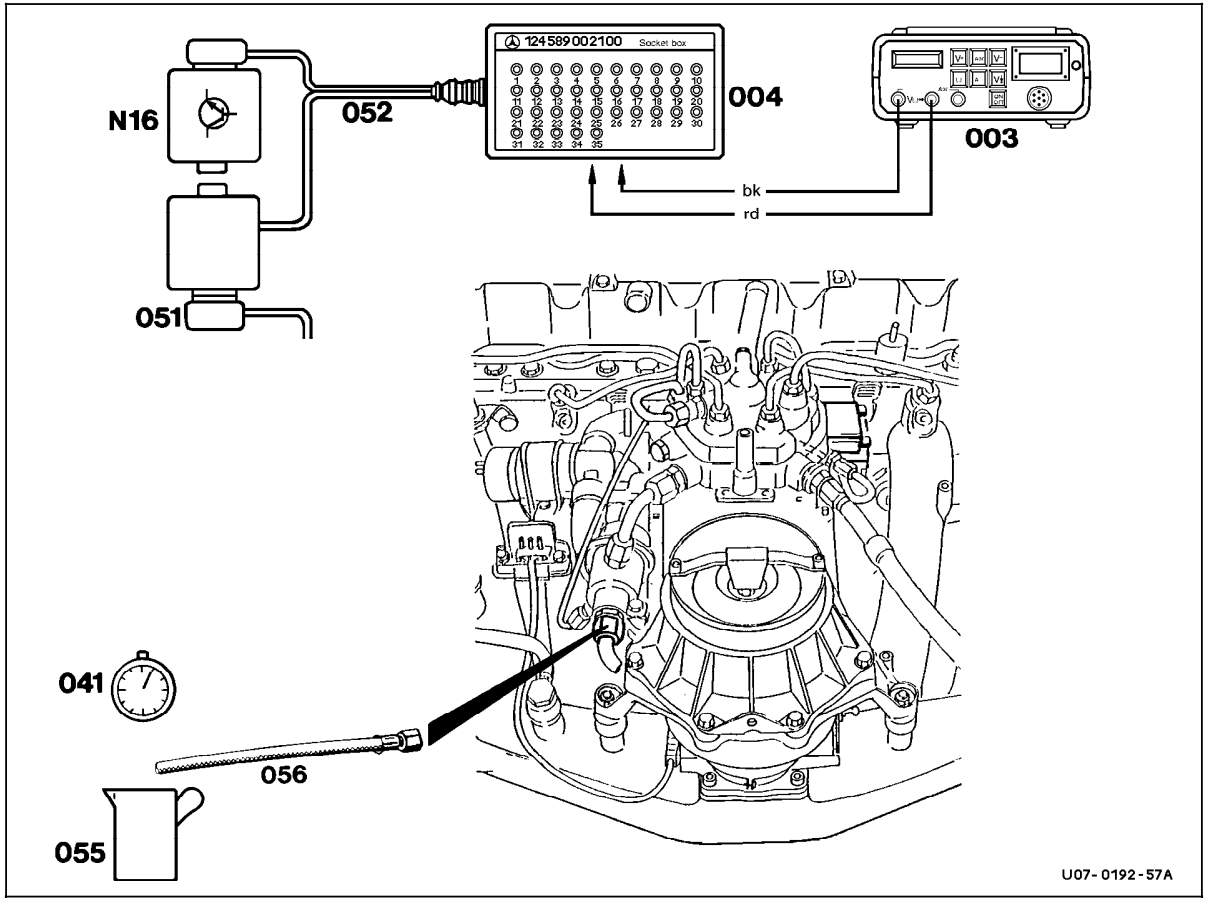
Conventional tools, test equipment

Description	Brand, model, etc.
Multimeter [1)]	Fluke models 23, 83, 85, 87
Fuel hose, 500 mm (20 in.) long	Local purchase
Measuring glass (1 liter minimum capacity)	Local purchase
Stop watch	Local purchase

1) Available through the MBUSA Standard Equipment Program.

Hydraulic Test Program – Preparation for Test (Testing Fuel Pumps)

Connection Diagram – Delivery Test
Engine 104



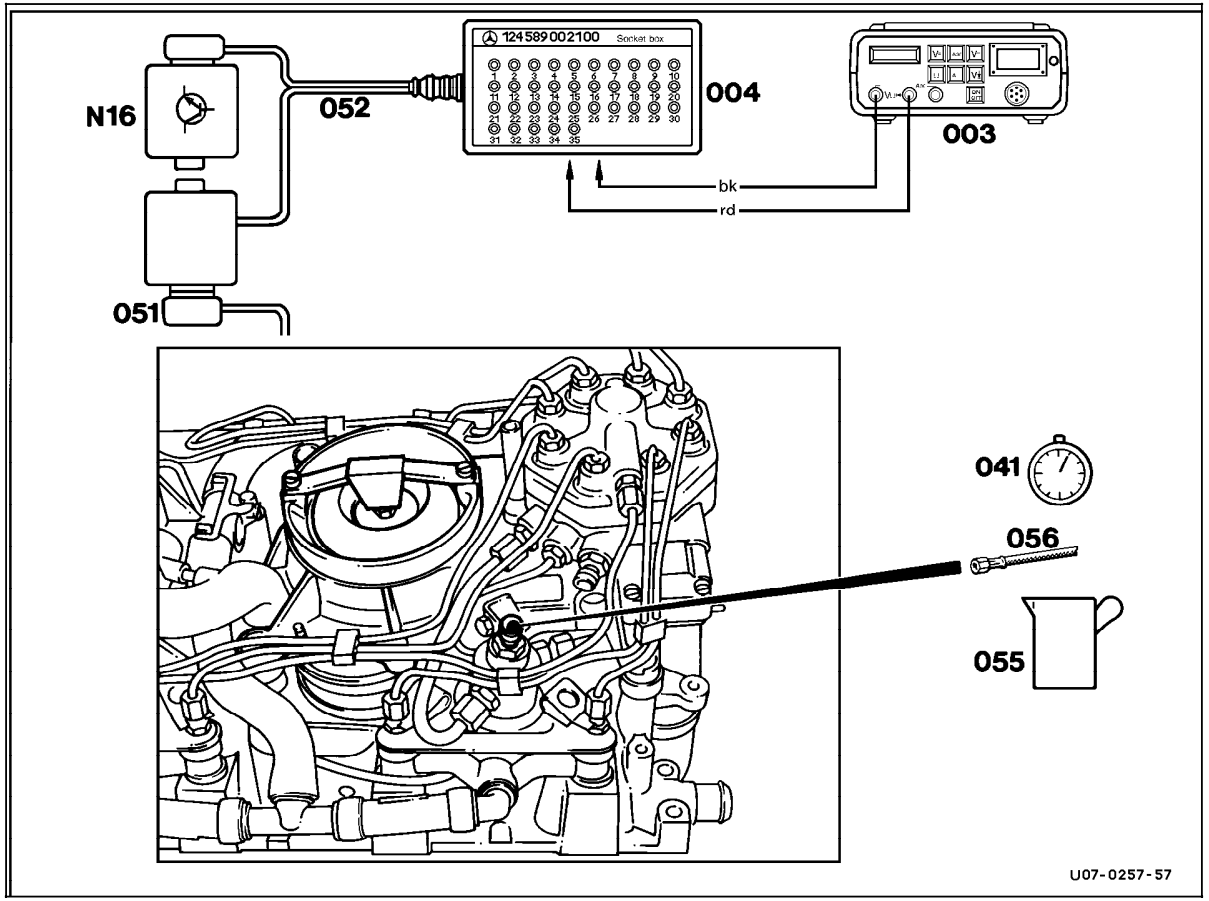
U07-0192-57A

Figure 1

003 Multimeter
004 Socket box (35-pole)
041 Stop watch
051 Connector, engine systems control module
052 Test cable
055 Measuring glass
056 Fuel hose
N16 Engine systems control module

Hydraulic Test Program – Preparation for Test (Testing Fuel Pumps)

Connection Diagram – Delivery Test
Engine 119



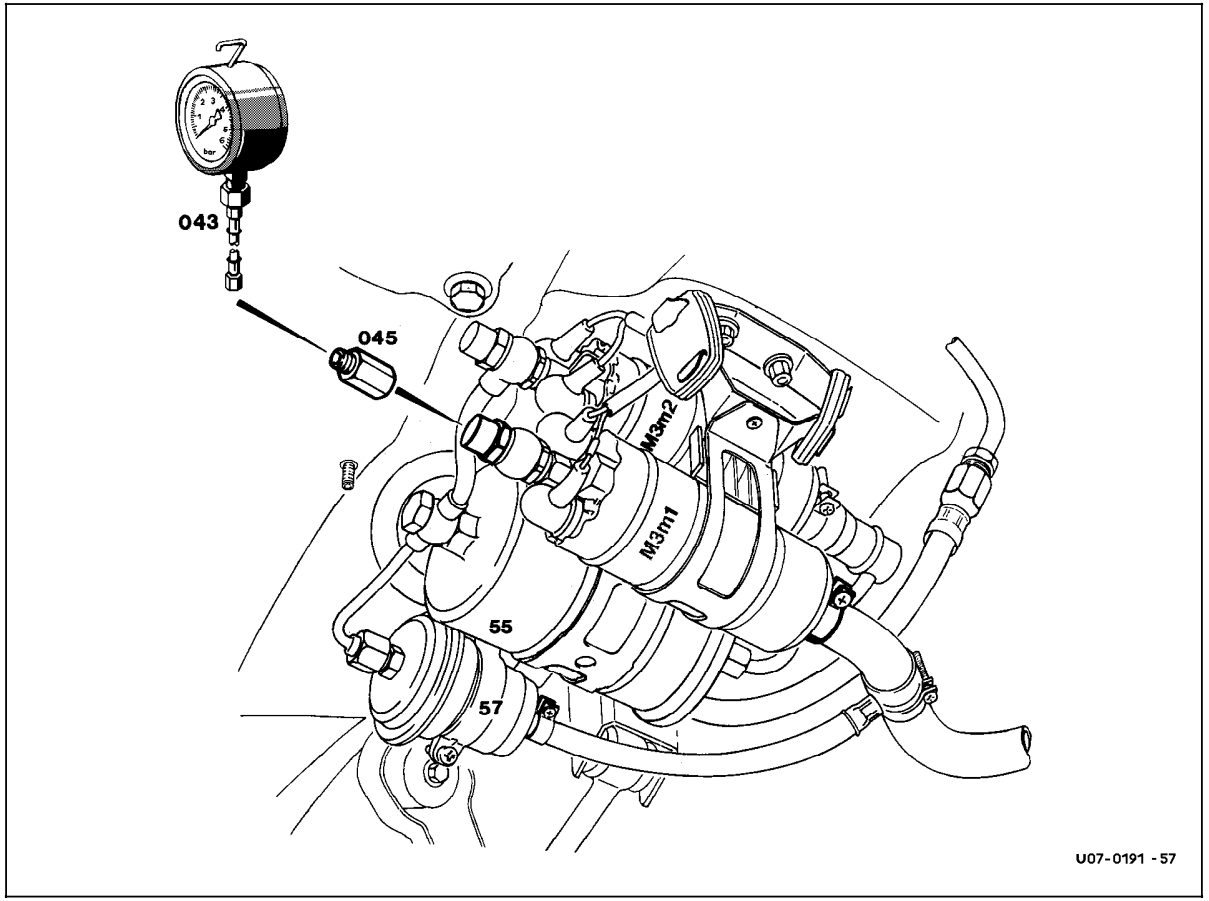
U07-0257-57

Figure 2

003 Multimeter
004 Socket box (35-pole)
041 Stop watch
051 Connector, engine systems control module
052 Test cable
055 Measuring glass
056 Fuel hose
N16 Engine systems control module

Hydraulic Test Program – Preparation for Test (Testing Fuel Pumps)

Connection Diagram – Fuel Pump Pressure Test
Engines 104, 119



U07-0191-57

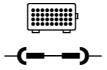
Figure 3

043 Pressure gauge, part no. 103 589 00 21 00
045 Adaptor, part no. 103 589 02 63 00
55 Fuel filter
57 Fuel accumulator
M3m1 Fuel pump 1
M3m2 Fuel pump 2

Hydraulic Test Program – Test (Testing Fuel Pumps)

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
1.0		Delivery capacity		Ignition: **OFF** Connect special tool fitting, part no. 000 589 01 91 00, and fuel hose (056) to diaphragm pressure regulator instead of fuel return line (35, Figure 1 or 2). Place other end of fuel hose (056) in measuring glass.		
				Ignition: **ON**	11 – 14 V (indicated only briefly)	Check battery voltage
				Engine systems control module (N16) unplugged. ⚠ End test after maximum of 40 seconds	1 liter after max. 40 seconds, current draw 6 – 10 A	• Check strainer in fuel inlet fitting of fuel distributor for restrictions, clean or replace fuel inlet fitting. • Check fuel lines for restrictions (kinks and dents). Repair as required. • Pinch leak-off line between fuel accumulator and suction damper with clamp. repeat fuel delivery test. If correct delivery is attained, replace fuel accumulator. • Replace fuel filter. • ⇒ 2.0.

Hydraulic Test Program – Test (Testing Fuel Pumps)

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
2.0		**Fuel pressure between fuel pump 1 and 2**		Unscrew cap on fuel pump 1 (M3m1), connect adaptor (045) and pressure gauge (043).		
			N16  1 2	Engine systems control module (N16) unplugged.		
				Read fuel pressure.	2 – 4 bar	Fuel pressure < 2 bar, replace fuel pump 1 (M3m1). Fuel pressure > 4 bar, replace fuel pump 2 (M3m2).
				Dissconnect pressure gauge (043) and adaptor (045) and check for leaks.		

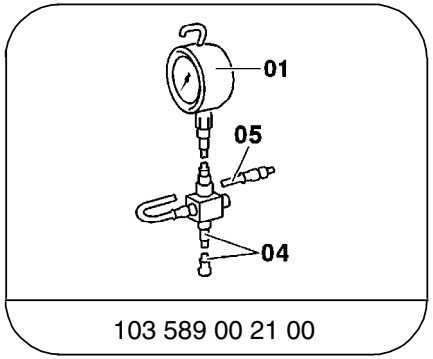
Fuel pump test values

Bosch no./MB no.			0 580 254 951/002 091 88 01
Measurement specification	with engine stopped and voltage at the fuel pump	min. V	11.5
Delivery capacity	Measurement location: at the fuel line after the diaphragm pressure regulator. Fuel tank at least half full.	min. l/s	1/40
Current draw		Amps	6 – 10

Hydraulic Test Program – Preparation for Test (Testing Cold Start)

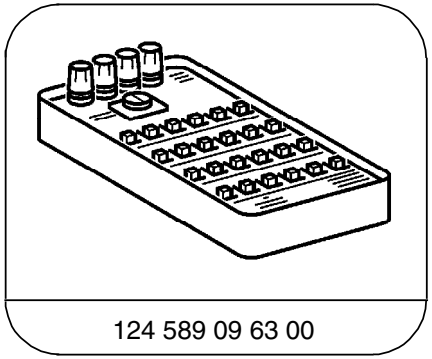
Preliminary work:
Testing starting system 34

Special Tools



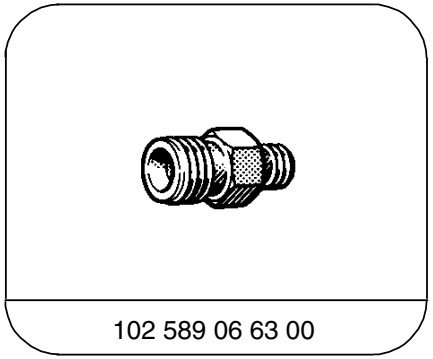
103 589 00 21 00

Tester



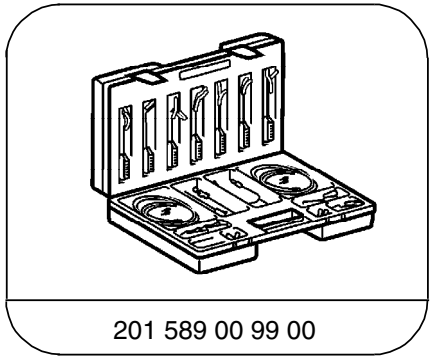
124 589 09 63 00

Ohm decade



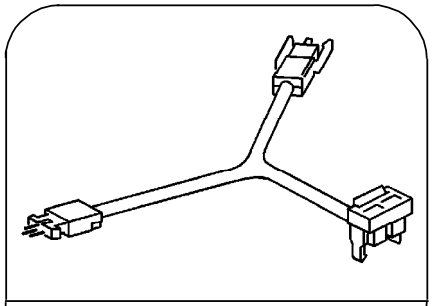
102 589 06 63 00

Double connection



201 589 00 99 00

Electrical connecting set



102 589 04 63 00

Test cable

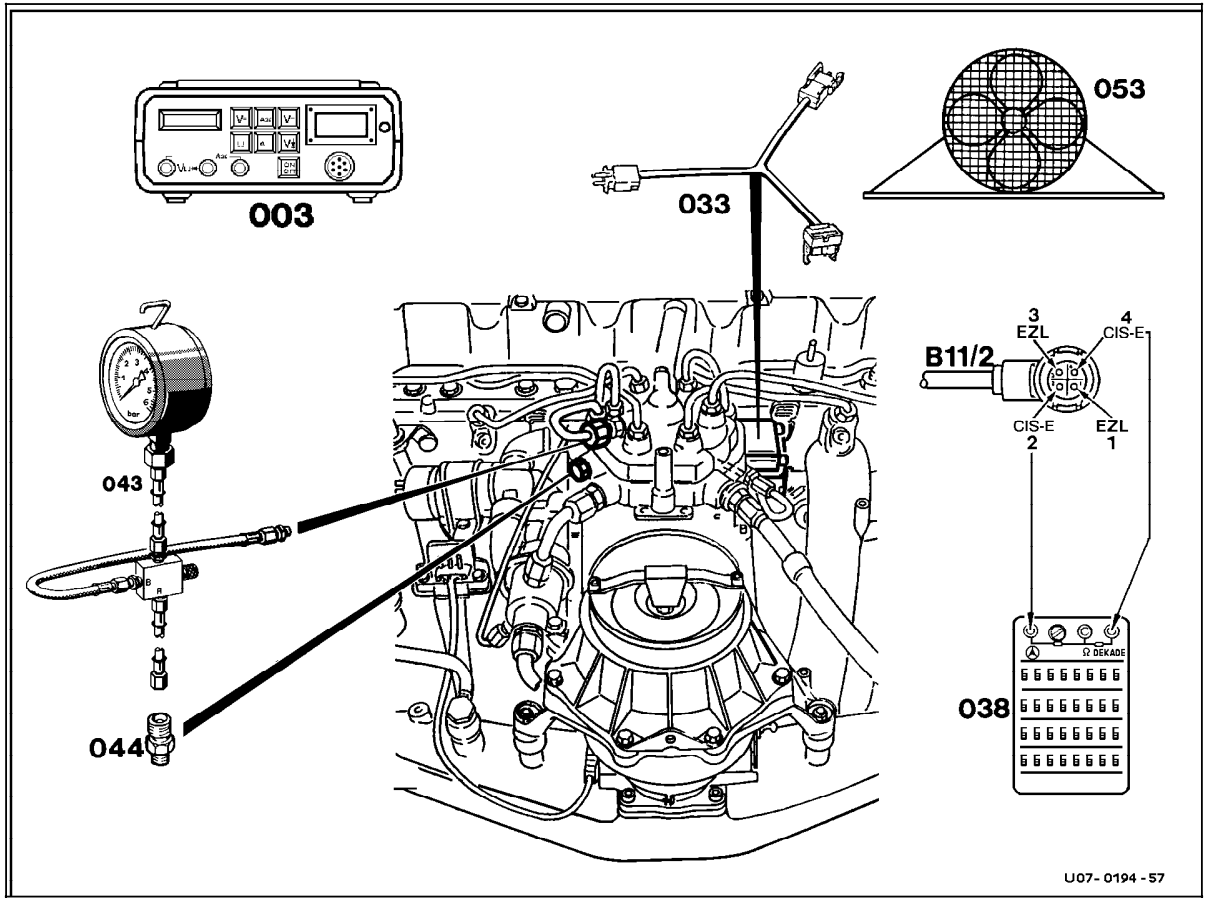
Conventional tools, test equipment

Description	Brand, model, etc.
Multimeter [1)]	Fluke models 23, 83, 85, 87

1) Available through the MBUSA Standard Equipment Program.

Hydraulic Test Program – Preparation for Test (Testing Cold Start)

Connection diagram – Engine 104



U07-0194-57

Figure 1

003 Multtimeter
033 Test cable, part no. 102 589 04 63 00
038 Resistance substitution unit
043 Pressure gauge, part no. 103 589 00 21 00
044 Adaptor, part no. 102 589 06 63 00
053 Cooling fan
B11/2 Connector, coolant temperature sensor

Hydraulic Test Program – Preparation for Test (Testing Cold Start)

Connection diagram – Engine 119

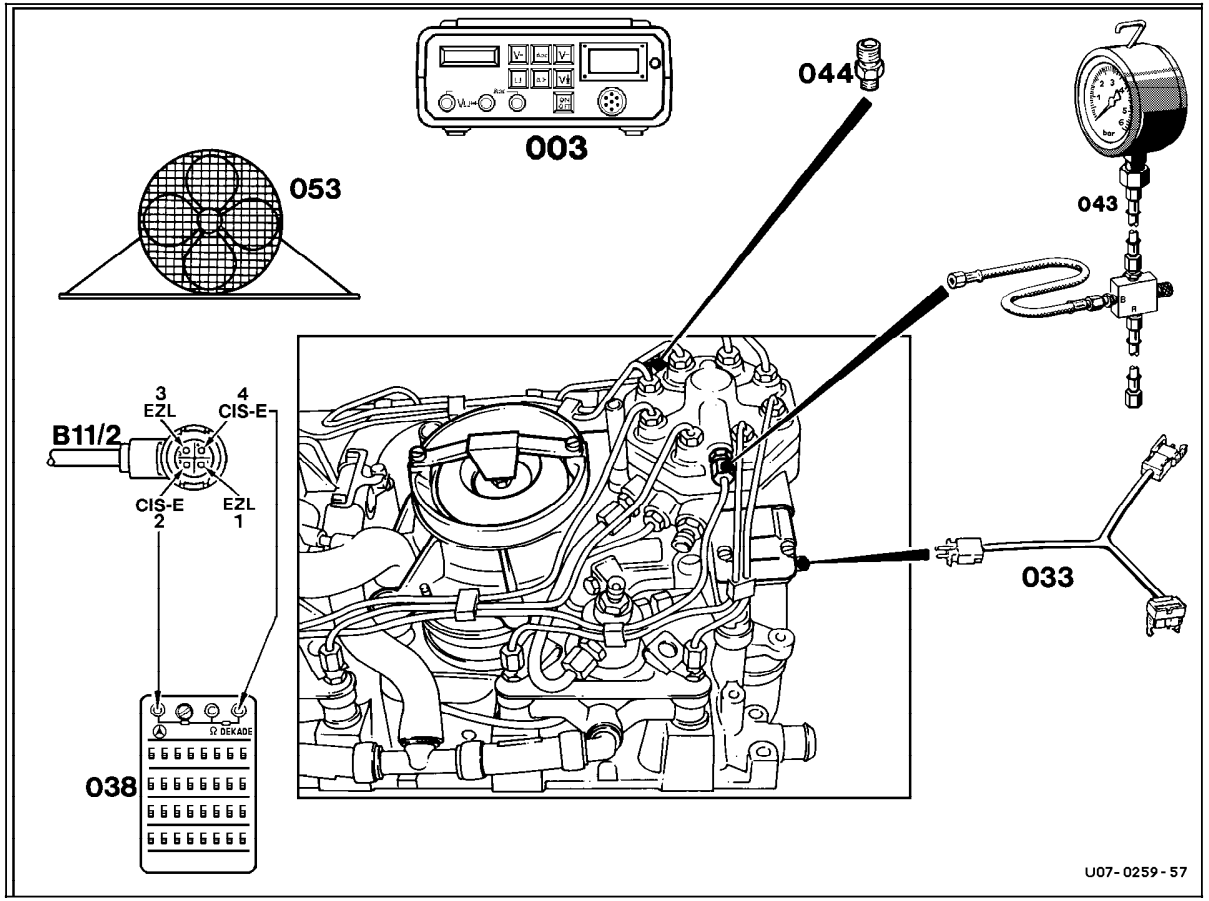


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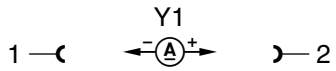
Figure 1

003 Multimeter
033 Test cable, part no. 102 589 04 63 00
038 Resistance substitution unit
043 Pressure gauge, part no. 103 589 00 21 00
044 Adaptor, part no. 102 589 06 63 00
053 Cooling fan
B11/2 Connector, coolant temperature sensor

Electrical Test Program – Test (Testing Cold Start)

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
1.0				Connect hose “A“ to lower chamber using adaptor (044), connect hose “B“ to upper chamber. (37, Figure 1 or 2) Ignition: **OFF** Connect pressure gauge. Run engine to build up pressure. Turn off engine, check for leaks		⇒ 1.1,
2.0				Ignition: **OFF** Connect test cable (033) to electro-hydraulic actuator (Y1). Cool engine with cooling fan (053) or let stand overnight.		
3.0		Cold start		Engine: **Start**	For fuel pressures see Table I. For current values see Table II.	Test fuel system pressure and internal leakage, 32. 23 ⇒ 10.0 23 ⇒ 11.0 23 ⇒ 13.0 23 ⇒ 14.0

Electrical Test Program – Test (Testing Cold Start)

Test and Adjustment Data

Table I Fuel Pressures

System pressure	with engine cold or at operating temperature	bar	6.2 – 6.4
Lower chamber pressure	with engine at operating temperature	bar	approx. 0.4 [1]
	at idle with coolant temperature < + 20 °C	bar	0.5 [1]
	during deceleration shut-off	bar	Lower chamber pressure equals system pressure.

[1] Observe Preparation for Test, see 22.

Table II Current Values

Engine	Current at EHA with Ignition: ON (mA)	After-start enrichment at an engine coolant temperature of + 20 °C (mA) [1]	After-start enrichment at an engine coolant temp. between 0 and + 20 °C (mA) [1]	After-start enrichment at an engine coolant temp. between 0 and – 20 °C (mA) [1]
104	20	3 – 5 [2]	3 – 45 [3]	38 – 80 [3]
119	75	5 – 8 [2]	5 – 42 [3]	42 – 100 [3]

[1] For resistance substitution unit resistance values, see 23, Table I.

[2] Read value 0 – 8 seconds after startup.

[3] Note the following:
- Read value immediately after startup.
- Selector lever position P/N.
- Throttle valve closed.